

# The Chemical Age

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## Chemical Works Staff

OPPORTUNITIES of talking to colleagues from distant parts of the world this summer have led to reflections upon the inter-relationship of chemical works staff. The duties of the staff in the chemical and chemical plant industries are as complex as those of any other industry—probably more so. They comprise research chemists, analytical and process chemists, physicists, chemical engineers, mechanical, electrical and civil engineers, salesmen and the commercial departments, costing and accounts, and so forth. It is no small problem to make all these diverse types, each with its own peculiarities, fit into the scheme of things and work together harmoniously.

The trouble starts right away in the research department. A large and well organised department will comprise some men who are engaged on research into matters of immediate interest to the firm's work, what may be called "applied research," whilst others, fewer in numbers, are engaged in fundamental research that has perhaps no probable early application but that it is hoped will provide information that an astute director of research can turn to account. We have noted a tendency for the fundamental man to consider himself as the salt of the earth and to conduct himself accordingly, though his "applied" colleagues regard him as a pure drone whose deficiencies in the way of practical results must be compensated by their own labours. Between the chemists and the engineers there is the same conflict of views, though it takes a different form. The engineer—and here we do not refer to the chemical engineer—has too often an unwholesome contempt for the chemist and all his works. The chemist, in the engineer's view, is useful to mess about with test tubes, but is regarded as an unpractical visionary whose usefulness ends sharply at the laboratory door. How far that attitude of mind permeates all branches of the chemical industry we do not know, but we do know of two large branches in which it is very marked.

We have heard of engineers functioning as chemical engineers in the established sense of the term who would not allow themselves to be called chemical engineers. On the other hand, there are many who were trained as pure chemists who describe themselves as chemical engineers. There is a lot of loose thinking in this field of nomenclature, and we are not at all sure that the teachers of chemical engineering are not at the bottom of it. A chemical engineer in their estimation is a man who has been through their schools and taken their prescribed courses. The number must be remarkably few comparatively. Chemical engineering is a new profession invented (if we may use the term) after the war and practically no one older than about 35

or 40 years of age can properly claim to have received that academic training which to-day would entitle him in the opinion of many to call himself a chemical engineer.

The truth is perhaps well expressed by a perfectly authentic remark made to us by a chemist—M.Sc. in chemistry at an English university—who went on to the staff of a small dye-works as a combination of senior chemist and general utility man. "After leaving the university," he said, "I did most of my chemistry with a spanner." That was the chemical engineer of 26 years and even less ago, and that was how chemical engineers were made. Chemical engineering in those times consisted in the running of the works by a man who understood the chemistry of what went on, acting in close collaboration with practical engineers—"fitters" in many instances.

One great problem is to give chemists a practical bias, and this proves difficult in many instances. There is surely something wrong in the method of training of chemists who propose to enter industry. All trained men who would enter industry should have a training which gives them some practical view of life. A famous industrialist told us that he usually selected his staff on the basis of their achievements *outside* their academic qualifications—from their prowess on the playing field, for example, and at the recent congress there was a striking unanimity of opinion, not confined to this country, that the playing of games that demanded team work was the finest possible training for those who would control men. We agree. It is that which gives to men the self-reliance necessary; and it is that which causes them to address their men in the style of: "Come on, lads, let's do this," instead of the aloof and even parade-ground style of: "Go and do that." There is all the difference in the world in the results achieved.

Another most important thing is to get proper co-operation between members of the staff. We heard of an instance of great value to the firm by collaboration between the works chemist and the cost accountant. It is necessary to find one or two in the several departments who can understand each other's language and who can work in sympathy, and co-operation often means doing this first of all—a fact not always realised by those who glibly talk about co-operation. We recollect an instance of a works engineer and a chemist whose lack of understanding was such that they seemed likely to come to blows frequently, but when they spoke to each other through the intermediary of a third man who understood the point of view of each, things ran with exemplary smoothness.

## Notes and Comments

### Containers for Chemicals

ONLY a very small number of chemical manufacturers make their own containers for the packing, transport and storage of their products. The vast majority depend upon the services of the manufacturers of containers, ranging from collapsible tubes and paper bags to large rail and road wagons. Almost every chemical product presents its own particular problem to the maker of the receptacle in which it is expected to retain all its useful properties from the time it leaves the manufacturer until it is used, and it is a tribute to the large number of firms engaged in making them that so few complaints are received. In this issue we review the special characteristics of many present-day containers and show how the railways and some of the principal road transport interests are catering for the long distance conveyance of chemicals. To help the container makers to find new ways of satisfying the requirements of users we invited thirty of the leading chemical manufacturers frankly to criticise their present service and to suggest means for increasing the utility of their containers. Only two gave comment, and in their letters, which we print in another page, they offer suggestions which we have no doubt will be welcomed and carefully considered by the makers of the containers in question. With extraordinary unanimity the others replied that they were quite satisfied with what they were already getting and had no suggestions to offer. We are agreeably surprised to learn that the makers have attained to such a high standard of perfection that only two among so many users can find room for any improvement, but the absence of criticism is not altogether helpful to those who are constantly studying the hundred and one properties which enter into the making of the most serviceable container. We have repeatedly urged in these columns that the plant user should be more frank in telling the plant maker what he really needs, and the need for better mutual understanding is no less real in the matter of containers. We find it hard to believe that there is so little room for further improvement.

### The Factory Report

A SUBSTANTIAL increase in the number of factory accidents in 1935, amounting to an excess of 9 per cent. over those of 1934, and as much as 32 per cent. over those of 1933, is recorded by the Chief Inspector of Factories, whose report is summarised elsewhere in this issue. Enhanced industrial activity accounted in the main for the increase, but it is satisfactory to learn from that section of the report which Dr. J. C. Bridge, the senior medical inspector, contributes on industrial health, that the health of the workers has not, so far as can be judged, been adversely affected by the increased activity. Indeed, the particulars of the notification of industrial poisoning or disease show in many cases a decided improvement on previous years, and tribute is paid to one particular chemical works engaged in the manufacture of intermediates which has taken steps to familiarise each departmental manager in the properties of the various chemicals handled by his group of workers in order to reduce the risk of injury to health. There is, however, one passage in Dr. Bridge's report which calls for careful reflection.

Reporting upon nine cases of aniline poisoning, he adds the significant statement that "doubtless there are many cases of slight poisoning which are not brought to the notice of the Department, as examination of factory health registers from time to time reveals." We had imagined that the work of the Department was too thorough to allow such cases to be overlooked, and we are now wondering whether a similar reservation applies to any of the other groups of accidents which come within the scope of the report. The report is of value only in so far as it presents a complete review of the accidents and cases of industrial disease and poisoning as defined by the various Factory Acts, and we hope that in future reports we shall learn exactly how many cases have occurred.

### Sources of Danger

A PART from those sections of the Chief Inspector's report dealing exclusively with the chemical industry there is much information which cannot be ignored by the chemical manufacturer who takes a pride in a low accident rate among his employees. Transmission machinery, hoists and overhead cranes are mentioned as special sources of danger. It is true that the dangerous practice of approaching unfenced overhead shafting in motion has become less prevalent, but the mere issue of instructions is not sufficient in all cases. The records of hoist accidents have shown that in nearly every case some better form of safeguarding or construction would have prevented the accident. Overhead cranes were responsible last year for 37 accidents to men on or near overhead gantries. Such accidents should be guarded against by a proper system for preventing all approach to crane tracks before the drivers have been warned and the cranes made "dead" by opening the main switches or removing fuses.

### Problem of Distressed Areas

THE problem of the distressed areas is not merely that of establishing new industries in them. There is the further difficulty of encouraging enterprising men to settle down in those areas to create and develop such industries. On this point Mr. John Benn makes a very useful suggestion in a letter to *The Times*. Mr. Powys Greenwood had pointed out that the prosperous leaders of the new secondary industries in the south might be deterred by domestic reasons from moving not only their factories, but their homes to what are officially known as the special areas, even if labour and other conditions there were possibly more favourable. Mr. Benn's solution is to encourage some of the younger business executives at present occupying junior positions on the boards of successful companies in the south, to try their hand at starting the new factories so urgently needed. Mr. Benn puts forward some detailed suggestions, and more particularly argues for the removal of the present condition under which the Commissioners for the special areas cannot assist the establishment of industries "operating for profit." He points to the obvious truth that business can only be run either at a profit or at a loss, and thinks that the element of risk is more likely to produce favourable results than the uncommercial code imposed on the Commissioners.

## Notes on the Construction of Wood Tanks

By JOHN D. WATSON

**F**OR certain purposes, notably the storage of corrosive liquors, tanks constructed of wood may be essential for obvious reasons, though for storing water a wood tank is equally a good proposition. Cast iron tanks are heavy and costly, although they are durable; steel ones, whilst lighter, are the more readily attacked by corrosion and particularly so by soft water; concrete, for large capacities, serves the purpose of water storage at ground level very well. Given suitable material, a wood tank is not difficult to construct in the hands of a good craftsman and it presents quite a number of advantages over either iron or steel.

The best wood for tank construction is red cypress which, by reason of its cypressene oil, stands up to water almost indefinitely and it is on record that such tanks have been in continuous use for 127 years and there are quite a number giving good service after forty or fifty years. This material does not taint potable water by imparting any disagreeable taste to it, but it is comparatively costly and good serviceable tanks can be made of fir, pine, poplar and yellow pine though Canadian redwood and B.C. Douglas fir are very suitable too and in most localities they are reasonable in cost.

### Canadian Redwood

Canadian redwood which is generally used in its native locations for the construction of wood stave pipe, is one of the few soft woods which stand up to water well. This is because it contains an acid which resists decay without the timber having any further treatment which might not only taint potable water but be absolutely inadmissible in the case of tanks storing chemical liquors or water used for some delicate process. Like B.C. Douglas fir, it is a straight grained, tough, durable timber though one which is easily worked and although the latter material when used for other applications in contact with water lasts considerably longer when it is thoroughly creosoted under the full cell process, like most others it stands up very well in the continuous wet condition and could be well relied upon in most instances. Obtainable in heavy sections, it is very suitable for supporting elevated tanks.

Seeing that the principal use of wood tanks, except in the timber-producing countries where they can be made very cheaply, is for the storage and handling of chemical liquors, one naturally inquires what the effects of any particular material would be in the matter of imparting colour to or otherwise affecting a liquor or how that material will stand up to corrosive liquors. In the first connection, the liquor itself may act as a solvent for any colouring matter the wood may contain without there being any pronounced chemical change or evidence of destructive action of the chemical upon the wood.

On the other hand, colour may be due to substances formed by the breakdown of the woody material under the action of the chemical.

### Effects of Corrosive Liquors

For instance, the dark brown or even black colour assumed by strong acids and alkalis is attributable mainly to the disintegration of the wood, and although some may be due to the extraction of pigment, a pronounced colour is usually accompanied by actual destruction of the timber. The mere extraction of pigment, while of little moment in some instances, would be detrimental in water used for some laundering and dyeing processes and in the production of edible products. Cypress, fir and pine do not impart any colour to cold water, it boils out in time from both fir and pine when the latter are in contact with boiling water, while cypress is usually quite colour free after three or four hours boiling. On the other hand, both oak and redwood contain

a large amount of colouring matter and this is freely given up to water even cold water and prolonged boiling does not wholly eliminate it, though maple while imparting a decided colour to hot water becomes practically ineffective after five or six hours boiling.

In the matter of taste which could be regarded as quite inadmissible in the case of any water or liquid used in food production, cypress, maple and redwood offend the least in this direction and oak only does so for a short period after being first put into use. Neither fir nor pine, however, can be relied upon, the latter, particularly, continuing to impart a most objectionable taste to boiling or even to hot liquids.

### Resistance to Acids

In so far as the effects of acids and salt solutions on wood tanks are concerned, the stronger chemicals will always bring out colour though in the case of weak solutions cypress, again, is the most resistant and oak and redwood the least. Up to 25 per cent. cypress remains uncoloured in contact with acetic acid; maple and pine only become light brown and sometimes even only faintly yellow. In 10 per cent. and weaker solutions of sulphuric acid, cypress again remains uncoloured and so do fir, maple and pine, but oak and redwood will impart colour to a 1 per cent. solution. All woods except fir yield colour to 25 per cent. sulphuric acid; 5 per cent. nitric acid is coloured deep yellow by all woods, but as the colour is nearly always the same it is usually concluded that it is due mainly to the formation of nitrogen from the acid itself rather than to any pigments extracted from the wood.

Caustic soda, even in 1 per cent. concentration, extracts colour from all wood even to the extent of stronger concentrations becoming black, though cypress and pine yield the least colouration. The same effects are seen in the case of sodium sulphide, while pale yellow is usually seen in wood tanks containing saturated filtered lime water and 5 per cent. bleaching powder suspension. Sodium carbonate, sodium bisulphite and sodium chloride take on a yellow or light brown colour except in the case of fir and pine, which are not affected in sodium chloride; oak will form precipitate in contact with sodium bisulphite and change the colour of a 10 per cent. solution to greyish-black.

On the other hand, while calcium chloride in 10 per cent. and 25 per cent. solutions remains uncoloured by all woods except oak and redwood, and turpentine is only slightly tinged, all hot liquids extract more colour from wood than cold ones do. For instance, 5 per cent. and 10 per cent. solutions of hydrochloric acid while uncoloured by cypress, fir, maple or pine when cold, take on a slight yellow or brown colour when boiling, and 1 per cent. caustic soda when boiling becomes opaque black when in contact with either fir, oak or redwood; cypress, maple and pine give a light brown colour which becomes deeper as the strength of the solutions is increased.

### Protective Paints

In the matter of protecting wood tanks from the effects of acids by so called acid-proof paints of the coal tar and asphalt varieties, while these are effective to some extent against 50 per cent. hydrochloric acid and 25 per cent. sulphuric acid, they are of little value against nitric acid or against caustic soda. At the best they merely retard destructive action.

It is difficult if not impossible to apply these paints as an absolutely impervious film to wood and even when the coating appears to be unblistered and in seemingly perfect condition an incision with a sharp blade reveals the interior of the wood to be more or less moist. The coating tends to peel off and blister sometimes in a soft condition and in other

cases quite brittle though it may have the appearance of being otherwise unaffected.

Given timber which will not affect or be affected by the liquid it contains, a wood tank can be equally well built in the circular or rectangular form, though the methods of construction differ considerably. The circular form of tank is economical in that it contains the greatest amount of liquid for a given weight of timber and structurally it is very strong.

For all practical purposes such tanks can be regarded as very large tubs except that the familiar hoops as associated with the common beer barrel, for instance, are replaced by bands of circular section, usually  $\frac{1}{2}$  in. in diameter spaced 6 in. to 12 in. centre to centre according to requirements, the closed spacing being at the bottom of the tank for obvious reasons.

### Binding the Vertical Staves

The ends of these bands are threaded—plus rolled-on threads are preferable here to cut ones—they enter a coupling (Fig. 1) and with nuts on the screwed portions tightened up against these lugs or couplings, the latter being usually small

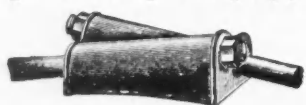


Fig. 1—Coupling for Stave bands of Circular Wood Tank

malleable castings, the vertical staves of the tank are bound together in a true circle, the subsequent swelling of the timbers making the whole construction watertight. When the tank is to hold acid, the hoops are spaced from the exterior wall by means of wood blocks about  $\frac{3}{4}$  in. thick. The dimensions shown in Fig. 2 and listed below are those usually worked to in the construction of these tanks, the height being as a general rule about equal to the diameter in the case of those up to 4 ft. diameter, and then the proportion gradually decreases so that a 10 ft. diameter tank would be about 9 ft. high to contain 4,000 gal., while a 20 ft. diameter tank containing 30,000 gal. would be 16 ft. in height.

Dimensions of Timbers for Wood Stave Tank. Fig. 2.

A	Thickness in the rough	..	..	2	3	4	inches
B	Thickness of finished stave	..	..	1 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	"
C	Depth of croze	..	..	1 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	"
D	Width of croze	..	..	1 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	"
E	Length of chime	..	..	3	3 $\frac{1}{2}$	4	"
F	Length of finished stave equals 1 in less than the given length	..	..	..	..	..	"
G	Thickness of bottom	..	..	1 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	"
H	Thickness of bevelled edge	..	..	1 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{2}$	"
K	Length of bevel	..	..	1 $\frac{1}{2}$	2	2	"
J	Thickness of bevel	..	..	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{2}$	"

In the case of wood tanks used for storing oil or tar, a small hole is bored through the edge of the stave six inches down from the top and a groove is cut down the edge almost to the croze. All the grooves are kept full of water by a small pipe connected from the outside to the horizontal holes. In this way the staves are kept thoroughly saturated and preserved from shrinking in spite of the action of the contents.

### Rectangular Tanks

For rectangular tanks a good general construction is shown in Fig. 3, which makes the principal features clear without much further comment. The counter-sinking and plugging of the vertical bolt heads should be noted and also the metal truss rods at the sides, which are recommended to give added strength to tanks over 6 ft. long.

In the matter of the metal fittings, corrosive conditions will call for some non-ferrous metal. Monel metal is, of course, by far the best material, but it is costly, and a good substitute is that grade of silicon copper known to the trade as Everdur metal. It possesses considerable strength, much more than common brass or even gun metal, and is reasonable in price.

Apart from that all the rods, nuts and washers should be of genuine Staffordshire wrought iron in preference to commercial mild steel, even in the case of water tanks,

as this material is much the more resistant to corrosion, and its small extra cost is always well worth while. All these metal parts should be well coated with bitumastic paint before being used.

In general, 2  $\frac{1}{4}$  in. material and  $\frac{1}{2}$  in. rods serve the purpose of tanks up to 12 ft. in length, 6 ft. wide and 4 ft. deep, which is a good average proportion of a rectangular tank. With the timber prepared either on the side or purchased milled from a good timber factor, bottom, end and side sections are assembled, after which the rods are inserted and packed carefully with cotton wicking or oakum before being tightened.

The end sections must then be inserted into the croze in the bottom, the rods packed, the end bottom supports put in position and the nuts pulled up finger tight. Then all the bottom rods are put in in such a way that they project equally on both sides. The assembled sides are then put in place after having been well white leaded in the croze.

### Some Important Details

The horizontal end rods are then inserted, the bottom rods packed as previously outlined, and the braces attached. The correct pulling up of the rods is now the important job. The horizontal ones are first pulled up through the bottom commencing at the centre, then the ends are seated in the croze and the vertical rods tightened through them, after which those through the sides are pulled up, and finally the horizontal end rods above the bottom. It is very important to pull them up evenly a little at a time to prevent any binding.

Finally, the truss rods are inserted and tightened up till the sides are in correct alignment. In order to ensure the ends being perfectly seated in the croze, a block of hard wood is placed against the side opposite the croze and the latter driven with a maul, this operation being repeated by placing the block on the top of the ends in order to drive

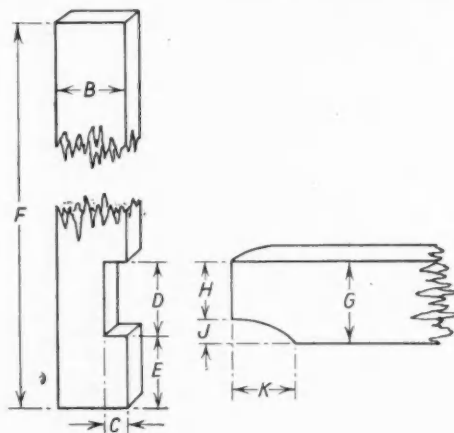


Fig. 2—Dimensions of Timbers of Wood Stave Tank

them well into the croze in the bottom. The final tightening up of all the nuts can now be done, but this must not be pushed to an extent which will crush the timber.

### Erecting Circular Tanks

As a constructional job, the circular form of tank previously alluded to is a comparatively simple proposition, but it is most important to have the staves machine milled to the concave and convex circles of the tank and the edges planed to the true radius. Where corrosive conditions do not call for non-ferrous metal the hoops are again best made from Staffordshire wrought iron bar and the lugs as malleable castings, though simple iron forgings would serve the purpose quite well. The holes should be drilled and the faces machined.

Care should be taken that none of the timbers

are bruised or splintered during handling, and after inspection for this and other defects, the first essential is to have a firm foundation, level and sufficiently strong to carry the load of the tank when it is full without any deflection.

them towards the top. After carefully tightening the hoops as evenly as possible, the tank should be filled and the natural expansion of the wet timbers should take up the leaks. If there is any appreciable leakage at any one point, it is best

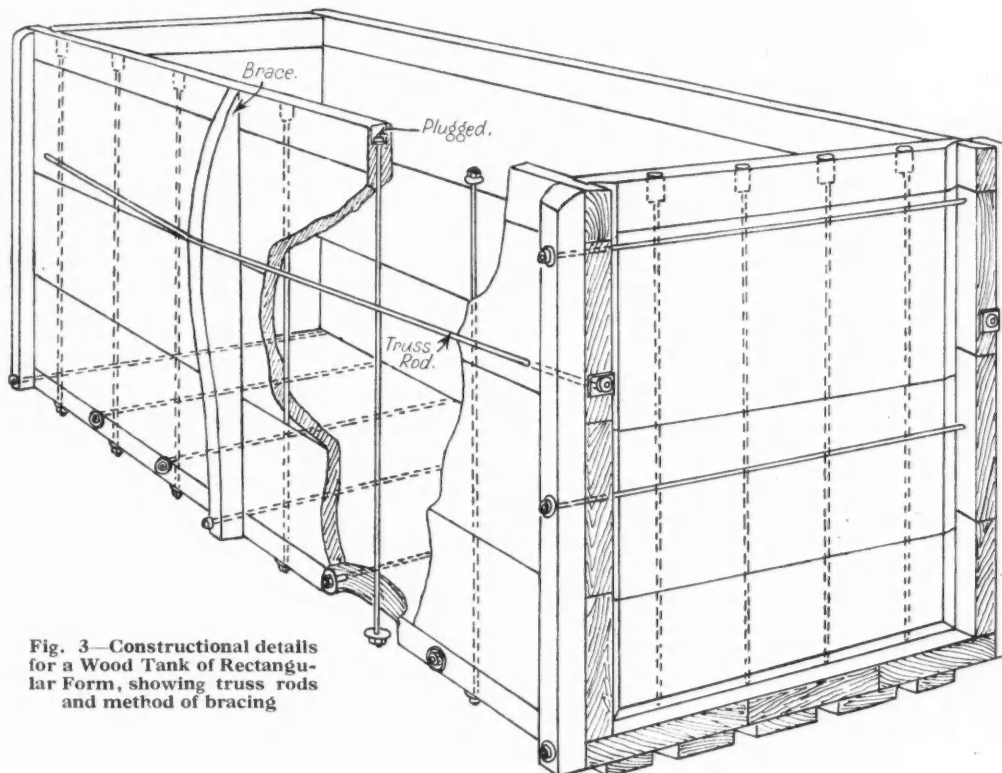


Fig. 3—Constructional details for a Wood Tank of Rectangular Form, showing truss rods and method of bracing

The bottom supports should be placed not more than 18 in. apart and the entire weight must be supported from the bottom only. That is to say, the staves must not carry any weight at all and there should be at least 1 in. of space under them and preferably more. It is then necessary to place the head or chime joists with their tops three or four inches above the floor and to note that they are 2 in. less in diameter than the inside diameter of the tank. The lower ends of the staves must be absolutely clear of obstruction. The bottom pieces are now laid crosswise on the joists and driven closely together with the dowel pins put in. A couple of boards should then be tacked across the upper side of the bottom to keep the planks in position till all the staves are put up and the bottommost hoop is in position.

In setting the staves one commences at the edge on one end of a bottom plank, driving the stave into place and keeping it perpendicular and square at the bottom; then it is driven tight on the inside, right at the bottom, leaving  $1/16$  in. to  $1/8$  in. outside to allow for tightening when the hoop is adjusted.

It is very important here to stagger the stave joints with the bottom joints at least one inch, and no vertical stave joint must, under any circumstances, be allowed to come directly over a place where two bottom planks are joined. When all is ready for the last, or closing, stave, the latter must be carefully hand planed to fit. This erecting of the staves is facilitated if a light rope is placed around them at the top and tacked to them by ordinary fencing staples.

With all the staves in place, the first hoop is put in position so as to be directly in line with the edge of the bottom, and this must be provisionally tightened before any more are put in place. This done, the next hoop is placed six inches above the lowermost one and then the others spaced so that there is a gradually increasing centre distance between

to draw down the water to that point till the leak has taken up, and while it may be necessary to do a little caulking, it should only be very sparingly and carefully done by means of the thinnest possible wood wedges.

## Sodium Nitrate Deaths

### Inquest on Middlesbrough Family

A VERDICT that death was due to poisoning by sodium nitrate accidentally mixed with ordinary table salt and consumed unknowingly was returned at an adjourned inquest at Middlesbrough on Tuesday on Raymond Cooper, 44, a chemical worker at the Billingham works of Imperial Chemical Industries, Ltd., and his wife and stepdaughter, who died after eating their Sunday meal on May 31. The coroner, Mr. O. H. Cochrane, said there was no doubt that the woman thought the substance was common salt and filled the salt cellar with it. "Now it is known that this is a dangerous compound it may be a warning to manufacturers that it is dangerous, and they might take steps to educate their workmen that it should not be taken away from their works; assuming that it had been taken from the works."

A fourth member of the family, Maureen, aged 10, had left for Sunday school before the meal started and is the only survivor.

Mr. A. Scholes, analyst, said the organs of the dead people contained evidence of sodium nitrite, and no other poisonous substance was found. Rhubarb which had been eaten by the family would quickly decompose the nitrite and evolve nitrous oxide, a recognised toxic gas.

## Power: a Raw Material for Chemical Industry \*

By A. SKELTON

**E**MPHASIS of the importance of electric power to the chemical industry is not necessary; electro-chemical and associated electro-metallurgical developments have in reality created a new industry, and have taken chemistry from the laboratories and made it an integral part of modern industrialism and civilisation. The countless new products and processes, and the improved quality of older products which have resulted from the combination of electrical power and chemical theories are evident on every hand, although the general public may not realise the part played by electro-chemistry. Less directly, the growth in industrialism made possible by electrical power has greatly broadened the demand for industrial chemicals, and has improved the standard of living and increased the demand for household chemical products from aluminium pans to cosmetics.

### Cheap Electric Power

A factor that does require emphasis, however, is the importance of low-cost electric power to the chemical industry. Chemical engineers and sales executives in every major industrial country well appreciate what the availability of large blocks of electric power, at \$10 to \$15 per continuous h.p. year, would mean in terms of new products, higher quality, lower costs and extended markets. Until the general public similarly appreciates these possibilities, however, they are not likely to be realised, for electric power at such costs can only be produced in a few areas in the world, and the prevailing current of economic nationalism prevents the development of them for the advantage of the world as a whole.

In the Dominion of Canada nature has provided a series of vast reservoirs and channels at considerable elevation above sea-level, which make huge quantities of water power available all the year round, with a minimum of artificial regulation and at a minimum of capital cost. An extensive development of some of these resources has already taken place, of which two-thirds is in use in the manufacture of products for export. In the chemical and metallurgical industries, and in the pulp and paper industry, a certain international specialisation of production and division of labour is already notable. Only a beginning has been made, however, as any survey of the undeveloped raw material and power resources reveals, and it is a question of interest not only to Canada, but to the world at large, whether this latent wealth should not be used.

### Development in Canada

A brief review of the development which has already taken place in the Canadian chemical and metallurgical industries will serve to illustrate both the national and the international importance of cheap electric power.

Dependent on the pulp and paper industry, which is the largest individual power consumer in Canada, are a number of chemical industries. Electrolytic caustic soda and chlorine plants at Sandwich and Cornwall find their market for chlorine almost entirely in the pulp and paper industry. As approximately 90 per cent of the Canadian pulp and paper output is exported, products which are used in this industry are, in effect, exported. The production by electrical processes of other raw materials for pulp and paper, such as sulphur and certain alkalis, is being actively developed. In addition, mention may be made of the important part played by electrical power in the production of rayon, cellophane and other cellulose products of chemical interest.

Another group of electro-chemical products depends on the mining industry, which is in turn a huge power-consuming

export industry. In fact, the chief domestic markets for industrial chemicals in Canada are the pulp and paper and metal-mining industries, and to both of these low-cost power and export markets are as important as are resources of raw materials to the development of the industries. The progress of the Canadian metallurgical industry during the depression, and its advance to the position of the world's largest exporter of non-ferrous metals is largely because the solution of the problems presented by the reduction of various complex ores coincided with the availability of low-cost electric power for reduction. The large gold and base-metal mining industries are important to the chemical industry in themselves, owing to their consumption of chemical products, such as explosives. The refining industry is not only a large consumer of chemicals, but becomes, in its more advanced stage a branch of electro-chemistry itself. The electrolytic or electro-thermal refining of aluminium, copper, lead, zinc, nickel and cadmium are all among the largest developments of their kind.

### Output of Ferrous Alloys

Other electro-chemical enterprises associated with the mineral industry are found in the electric-furnace output of ferro-manganese, ferro-chrome, ferro-silicon, and other ferro-alloys, which are marketed largely in the United States. Aluminous abrasives and silicon carbide result pre-eminently from cheap power, and are now produced on a large scale in Ontario and shipped to the United States for final treatment. Calcium carbide, acetic acid, and numerous acetic derivatives form another group of electro-chemicals produced on a large scale in Quebec for export.

The fertiliser industry is another important example of a chemical development which has recently expanded rapidly with the aid of electric power. The fixation of atmospheric nitrogen by the production of calcium cyanamide at Niagara Falls is a long-established enterprise, which is one of the largest single power consumers in the Dominion. Of recent growth, but already of importance in world markets, is the by-product production, based on waste smelter gases, at Trail, of ammonia, ammonium sulphate, and superphosphate.

The following table illustrates the magnitude of the hydro-electric power industry in Canada, and the proportionate importance of the chemical and metallurgical industries as power consumers:—

Available 24-hour water power at 80% efficiency:		
At ordinary six months' flow ..	33,617,200 h.p.	
At ordinary minimum flow ..	20,347,400 h.p.	
Turbine installation, 1st Jan., 1936 ..	7,909,115 h.p.	
Total kW.-hr. output, 1935:		
Central electric stations and approximate private installations ..	25,000,000,000 kW.-hr.	
Chemical and metallurgical consumption, 1935, approx. ..	3,750,000,000 kW.-hr.	or 15%

### Dependence on Export Markets

The outstanding economic feature of the chemical and associated industries which have already been developed in Canada is their dependence on export markets. In some striking cases, such as the production of aluminium and ferro-manganese, the raw materials are imported to be worked up with Canadian power, and the products are exported. The only regret of Canada, Norway, and other low-cost power areas is, of course, that such a movement does not take place on a larger scale. The advantages of securing power, or industrial materials processed cheaply by power, are evident to any industrial community. The difficulties which tend to prevent the most economic utilisation of the world's power resources are many and series, however, and to countries like

\* From a paper presented at the Chemical Engineering Congress, London, 1936.

Canada, which cannot hope to use their available power for purely domestic purposes, extremely important.

One obstacle is the strategic importance of the electro-chemical industry to-day. Dependence on electro-chemical imports would be a serious military weakness for any major power. The cost of electric power cannot be considered when national defence is in question, and when the electro-chemical and electro-metallurgical industries are such vitally important units in national defence.

Another obstacle is in the low level of international trade to-day. Even if a nation wishes to aid its domestic industry by making supplies of crude electro-chemicals available cheaply from foreign sources, the problem of securing foreign exchange to pay for these imports still remains. Unless exports can be expanded, it may temporarily be less strain on the national economy to pay twice as much to develop domestic power sources as to make use of foreign sources.

A third obstacle may lie in the extensive growth of the

cartel form of organisation in the world chemical industries. The need of some defensive organisation to protect capital invested in industry may be readily conceded, but it appears to be an inevitable corollary that the existing producing and marketing system must freeze into a relatively rigid structure. Until world industrial demand rises to new peaks we must expect that the major units in the world chemical industry will strive to maintain the existing structure unchanged, and to check the development of new productive capacity. It is quite natural that this check on new development will be felt most acutely by exporting countries, which have little scope to encourage increased production by domestic protection.

Canada, the foremost world exporter of electro-products, is naturally deeply concerned by these obstacles. Until they are removed the further development of Canadian power resources will be delayed, to the economic loss of Canada and the rest of the world.

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## Letters to the Editor

### Suggestions from Container Users

SIR,—While most manufacturers of containers are very ready to give consideration to suggestions from users, we have frequently received the ultimate reply that the cost of making the improvement would be excessive.

What is really meant is that the cost would be too heavy if spread over merely those sales in respect of which there is an obvious and immediate demand for the improvement—*i.e.*, very often simply the inquirers' own purchases. Many other users would, however, probably welcome the improvement if the proposal was known to them, with the result that container manufacturers would be able to spread the cost over a large volume of sales, thus making the incorporation of the improvement a practical proposition.

Your paper might be of considerable assistance in this respect by advising chemical manufacturers of the suggestions put forward for the improvement of containers and by inviting comments by letter. Where it was found that a suggestion received a considerable measure of support it would be possible to notify the container makers to this effect, either directly by a note appearing in your paper or through the firm making the suggestion.

Under such a scheme points which might usefully be considered are:—(a) Improvement in the screw caps for drums containing liquids, *e.g.*, the provision of caps which would provide an effective dust protection; (b) the provision of necks for glass bottles, which would be quite uniform internally to facilitate more efficient corking.—Yours faithfully,

THE GENERAL CHEMICAL AND PHARMACEUTICAL CO., LTD.

R. S. HASKEW,  
Director.

Judex Works,  
Sudbury, Middlesex.

SIR,—Generally speaking, in our view, efforts are constantly being made by British manufacturers to increase the efficiency of containers in order to satisfy the exacting conditions in the chemical industry. In particular we may note the recent improvement made in wooden containers. From the point of view of both storage and utility the new improved pattern of venesta keg, which has been generally standardised throughout the trade, has proved particularly satisfactory and welcome.

Our experience of metal containers is less satisfactory. We admit that the standardisation of such containers presents certain difficulties in view of the varied nature of the chemicals involved. We have in mind, in particular, the type of drum used for the supply of heavy chemicals, say 50 gal. and upwards. While certain branches of the industry have

evolved packages well adapted, from the point of view of utility, to the product concerned, in general there does not appear to have been any effort to produce a package which will satisfy all requirements. For instance, the returnable drums now supplied for the bulk of our heavy chemicals are particularly ill adapted for drawing off small supplies.

We would strongly recommend that, instead of the screw stopper at present used, necessitating either syphoning off the contents or tilting the drum and pouring into a smaller container, with consequent loss of material at each operation, there should be adopted throughout the trade a standard thread stopper placed in such a position that a tap (also of a standard size) could be inserted and the liquid thereby drawn off. Such a device would be generally welcomed, resulting as it would in considerable saving of material and labour.

In regard to smaller non-returnable drums, we would draw attention to the practice in many cases of soldering down the aperture, resulting in waste of time when opening, the solder having to be laboriously chipped away, and frequently the chemical becomes contaminated. There is considerable room for improvement in this type of container. A suggestion which occurs to us is a closure consisting of a light metal seal of the "pull-to-open" type, which could be torn off to expose a lever lid.

So far as concerns containers used for fine chemicals, we would mention that while much service has been rendered by the makers of tins to meet the exacting requirements of the trade, there is room for still further improvement. We should like, for instance, to see the production of tin containers treated internally so as to obviate the necessity for a special lining, and externally in such a way that a pasted or gummed label will adhere permanently. Further, there is scope for ingenuity in the production of a biscuit-lid tin, the lid of which can be easily secured and yet be pilfer-proof.—Yours faithfully,

THE BRITISH DRUG HOUSES, LTD.

R. R. BENNETT,  
Director.

Graham Street,  
City Road, London, N.1.

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PRODUCTION of superphosphate in Japan rose from 1,082,745 metric tons in 1934 to 1,274,231 tons in 1935, while cyanamide output increased from 141,109 to 204,791 tons. Ammonium sulphate production during the eight months ended March, 1936, reached 730,000 metric tons, a 27 per cent. increase over the corresponding period of the previous fiscal year.

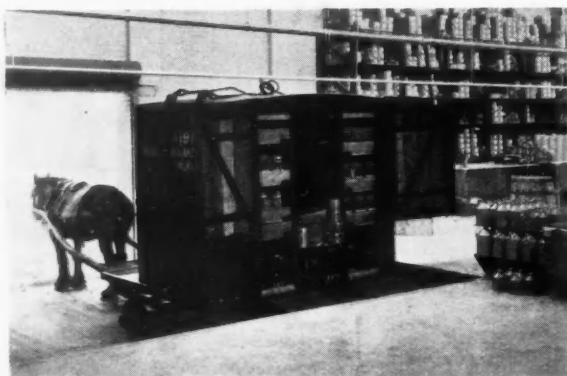
## The Transport of Chemicals by Rail

### Door-to-Door Containers Meeting Individual Needs of Users

**U**NDER present-day conditions the transport requirements of the chemical industry are assuming increasing importance. The conveyance of its products from place to place must be carried out with safety, rapidity and economy.

For many years the British railways have made a specialised study of the transport needs of this industry, and the accumulated experience and adaptability of their organisation to changing conditions has enabled the railway companies to provide the most efficient means of transportation. To-day the British railways are carrying annually huge quantities of the multifarious products of chemical works and laboratories. A glance at the "General Classification of Merchandise by Goods Train" will give some idea of the comprehensive range of traffics usually handled.

The normal and most economical means of conveying liquid chemicals in bulk is by the railway tank wagon, which runs over the railway on its own wheels and can be loaded at the works. The contents are discharged at destination by means of gravity or by pumps. Recently there has been a growing



**Leyland Shelved Container as used for door-to-door transport by rail**

disposition on the part of chemical manufacturers to use, in addition to railway tank wagons, a form of demountable tank. These are mainly employed where firms do not possess a private siding facilities and enable them to load the contents at the works, convey them by lorry to the railway dépôt for loading on to specially equipped railway chassis for conveyance to destination station, where the tank may be unloaded to road vehicle for delivery to the customer.

This leads one on to mention the railway container system, which has been one of the most striking transport developments of recent years. There are many chemical and allied products which lend themselves to this modern means of conveyance.

The container is a demountable truck body which is interchangeable between rail or road vehicles. Its advantages, which have been proved beyond all doubt as resulting from the introduction of this mobile system of transport handling, are a reduction in packing costs, labour and materials, minimised risk of breakage and pilferage, the elimination of returned empties, and the reliability of delivery. Goods loaded into a container are not touched until they are delivered to the consignee. Containers operate on terms of equality with commercial motor vehicles, and being separate units from the chassis can travel both by rail and road. In the case of covered containers, the doors may be padlocked and the keys posted to destination, if desired.

In order to meet the requirements and suggestions of traders, a number of varying types of containers have been evolved. The most popular is the "B" type of covered con-

tainer; this is approximately 14 ft. long, 6 ft. 6 in. wide, and 6 ft. 8 in. high, and has a capacity of 4 tons. There is a smaller type of covered container of 2½ tons capacity. An unusual type of container has been specially constructed for the carriage of solid carbon dioxide. It is insulated by cork to a thickness of 10 inches and the loading and unloading operations are performed through a hatchway fitted in the roof.

For the conveyance of explosives special gunpowder vans are provided by the British railways. These are equipped with padlocks and each van contains rubber boots which are worn by the men engaged in the loading and unloading to avoid any risk of explosion from friction. These wagons are distinguished in a very clear manner on the outside and are subjected to close watch and control throughout their transits over the railway system. The conveyance of poisons in carboys and drums also calls for special attention on the part of the railway company, and goods depots are provided with large iron receptacles in which the carboys, etc., can, in case of need, be placed during transit. The object of this is to ensure protection not only for the goods themselves, but also for other goods which may be loaded in the same wagon.

With the object of safeguarding life and property the Home Office imposes very stringent regulations on the railway companies in regard to the conveyance of goods of a dangerous or explosive nature and every precaution is taken by the staff of the railway companies to ensure complete safety during transit. There is no doubt that the methods adopted by the British railways for dealing with the products of the chemical industries have done much to enhance the efficiency of the marketing organisation which the industry has set up, chiefly by reason of the safeguards made and the special equipment and facilities available by rail transport to ensure the goods reaching the destination at reasonable cost and in perfect saleable condition.

### Alternative Forms of Container

THE cylindrical containers made by The Guelph Cask, Veneer and Plywood Co., Ltd., are of two distinct types; the "Guelph" cask and the plywood keg.

The "Guelph" cask, although first marketed over 50 years ago, is still in great demand owing to its abnormal strength, adaptability and freedom from odour. The cylindrical walls are constructed of veneer staves sturdily held by closely spaced outer wooden hoops. No glue whatsoever is used in this construction and the timber thereby retains its natural elasticity—a factor very necessary for the safe transport of either fragile articles or heavy weights. Various forms of linings can be fitted to meet the requirements of the different products to be packed.

The plywood keg is similar in construction to that supplied by various other makers, and is supplied in different types from the light grade with veneer hoops to the all-riveted type bound with outer hoops of plywood. This form of keg is in demand where light and cheap containers are required, but, as already stated, where safe delivery of heavy weights, or freedom from odour is a necessity, the "Guelph" cask is still considered essential.

CZECHOSLOVAK alcohol sales during the first nine months of the 1935-36 alcohol production year (beginning September 1, 1935) totalled 676,500 hectoliters as compared with 638,000 hectolitres in the same period one year earlier, an advance of 5.7 per cent. The increase in sales of 38,500 hectolitres was due largely to an advance in sales of motor fuel alcohol (34,400 hectolitres).

## Bulk Transportation of Liquid by Road

### The Problem of a Consignment of Tallow

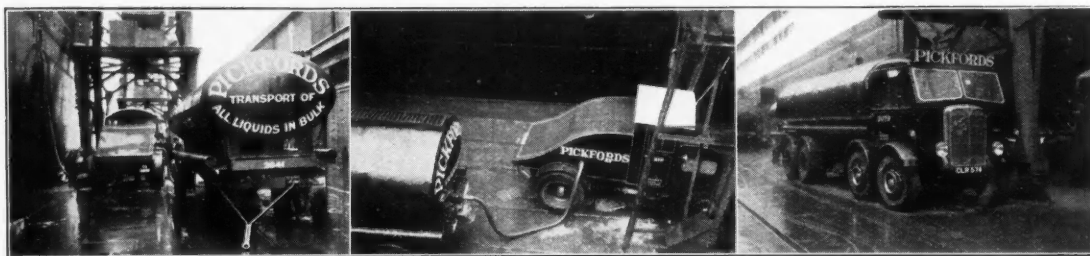
**T**HERE is a rapidly increasing tendency amongst manufacturers of acids, oils, chemicals, and other fluids to have their products transported in bulk. This method has many advantages over the use of barrels and drums; as by this means it is possible to avoid the tare weight of the container, the cost entailed in the return of empties, their cleaning, and cooerage.

Where a buyer or manufacturer has no private railway facilities, special equipment is now available either to convey his commodities by road throughout, from storage tank to storage tank, or to despatch them in liquid form by railway tank wagons, using road tank vehicles for the local haulage, the liquids being quickly transferred from one to the other by rotary pumps or air compressors. When the idea was first conceived of transporting liquids in bulk, Pickfords were well to the fore in establishing a special department for this type of traffic, and after a careful study had been made of the requirements of manufacturers as regards viscosity, specific gravity, setting temperature and so on, a fleet of special tank

was carried from the north of England to London. When it was discharged fifteen hours later the temperature had only fallen three degrees.

Subject to restriction by the Home Office and Road Traffic Act, insulated vehicles are available in capacities ranging from 1,000 to 3,300 gals.; others without insulation up to 3,600 gals. The load weight, of course, varies with the specific gravity of the liquid. In the case of Pickfords, all their vehicles carry the largest possible capacity tanks; these are equipped with rotary pumps driven from the engines, and are able to discharge, through 4 in. outlets, a ten ton load to a height of 30 ft., if necessary, in about half an hour, whilst for barrelling purposes taps are provided.

For long distance work Pickfords have stationed in London a fleet of rigid eight-wheeled tank vehicles, most of which are fitted with twin compartment insulated stainless steel tanks with a capacity of 3,300 gal. These are the latest type of tank wagon for bulk transport. The company receives interesting commissions, a recent example being an



Photos]

[“The World’s Carriers”

Left: A Scammell Tractor Unit pumping tallow from one of Pickfords Tank Trailers direct to ocean-going ship. Centre: The pipe connection between tank and pump (which is housed on the back of the tractor). Right: This A.E.C. Mammoth Major Eight-Wheeler Tank Wagon is a recent acquisition by Pickfords

wagons was built to operate throughout the country from their depôts at Liverpool and London.

In the ordinary course of trade the demand for the transport of liquids varies considerably, vegetable oils, caustic liquor, acetates, ink, sodium silicate, soap oils, edible oils, molasses, glucose, fuel and lubricating oils are but to mention a few. In consequence special vehicles cannot always be provided for each particular commodity, exhaustive tests were therefore carried out in order to ascertain the most suitable method of cleaning the containers and the prevention of contamination. As a result, Pickfords now have vehicles carrying mild steel, stainless steel, and aluminium tanks which are cleaned thoroughly between liquids by the use of steam, for which they have specially installed plants at their London and Liverpool depôts.

There are, of course, certain acids which demand special tanks on which there will be no corrosion effect, and which have to meet Home Office regulations. As these are not interavailable for other liquids they can, of necessity, be supplied on a contract basis only. In this connection it might be added that Pickfords are prepared to adopt their tank motors to the carriage of any kind of liquid in commercial use, or will lay down special equipment for this purpose.

The insulation of the containers is a very important feature, as amongst the various liquids carried many set at a relatively high temperature, the loading temperature must therefore be adequately maintained or else the discharge of the consignment becomes very difficult. To ensure this all tank wagons are insulated, usually with two inches of “Alfol.” This material is rather like tinfoil, and its heat retaining properties were clearly demonstrated a short time ago when a ten ton consignment of whale oil, was loaded at 140° F., and

order to convey 265 tons, or approximately 65,000 gal. of liquid tallow from Stanwell, Middlesex, to the Cunard White Star motor vessel “Brittanic,” at a temperature of 150° F. The consignment was completed in 22 loads, approximately 3,000 gal. per tank, and was delivered into the storage tanks of the liner through the pumps attached to the vehicles.

In the ordinary course, with tallow in its more usual solidified form, the consignment would have necessitated a considerable amount of handling; in addition, each barrel would have had to be weighed, painted and stencilled on both heads. In its liquid state all these operations were avoided, the tallow was simply drawn from the firm’s storage tank into the tank wagons, taken on its 25 mile journey and pumped into the specially heated tank in the liner, the whole operation, including the journey, occupying less than six hours, and without any fuss or bother. This consignment was shipped to America, and marks the first occasion on which a commodity has been shipped in hot liquid form by road and then by water from this country across the Atlantic. When one considers that by the ordinary method of shipping some hundreds of barrels would have had to be filled, the freight on the barrels paid and the tallow again liquified, the advantages of bulk transport become obvious.

Another example may be instanced in connection with the Cunard White Star liner “Queen Mary.” Prior to the vessel leaving Glasgow on her trials, the Vacuum Oil Co. received an order to deliver 23,000 gal. of lubricating oil for the turbines. The entire quantity, which travelled by road from Birkenhead to the Clyde, was delivered in Pickfords mammoth tank wagons. The journey was made at Christmas time under the worst possible conditions.

Dense fog was encountered practically throughout the journey, in addition the roads were covered with ice, which made control of the huge tank motors a nerve wracking job. Despite these difficulties, however, the tankers arrived in good time and delivery effected without a hitch.

Such examples show the great advantages attached to the conveyance of liquids in bulk, and clearly indicate the possibilities of development in regard to despatching commodities which are both manufactured and used in their liquid form.

## Wood Vats and Tanks for Chemical Works

### California Redwood as a Vat-Making Timber

THE introduction of California redwood (*Sequoia sempervirens*) as a vat-making timber has been the principal development in the vat-making trade during the past year. Actually, there is nothing experimental about this

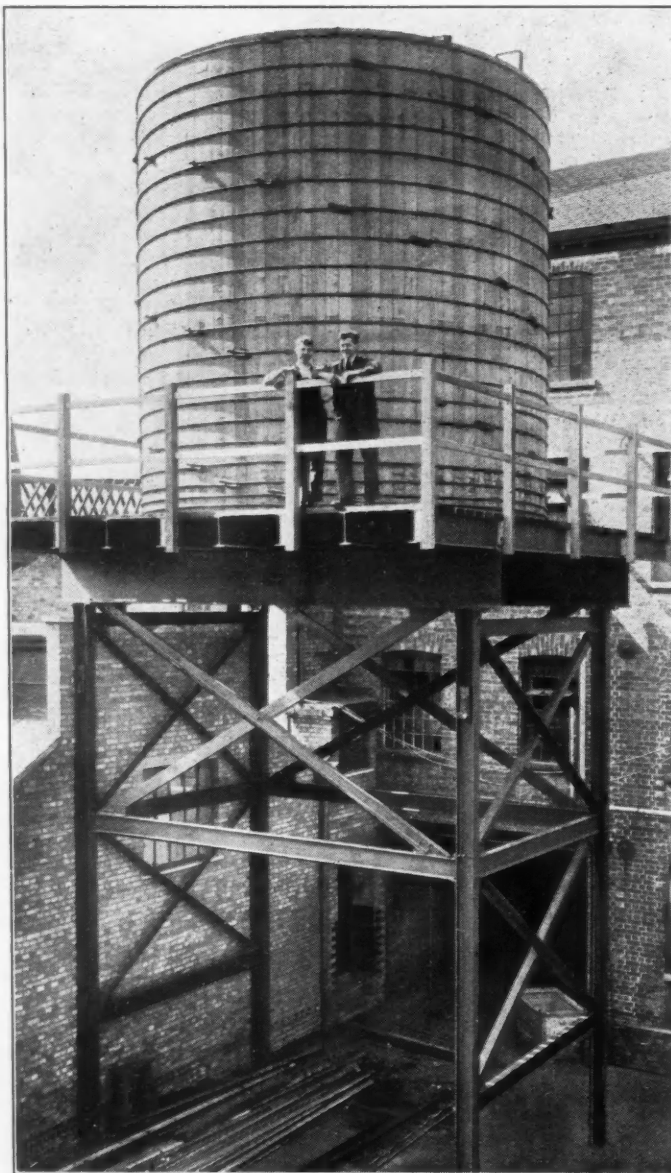
timber. Thousands of vats of all sizes and for all purposes tank in the world, 130 ft. diameter by 18 ft. deep, capacity 1,700,000 gal., is made of California redwood, and was installed for a sewage disposal plant where steel or concrete was unsuitable. The timber is known in this country, and has been used here for vats, but has not so far been exploited for this purpose on a commercial scale.

The most notable characteristics of California redwood are its exceptionally low susceptibility to shrinkage, its durability and its lightness in weight. The first of these qualities makes it very useful for vats installed in warm rooms, or for export to hot climates. Its durability naturally depends on contents, but there are records of water storage vats, exposed to the weather, installed 75 years ago and still going strong. It is excellent for such acids as acetic and tannic, and compares favourably with other timbers in resisting sulphuric and hydrochloric acids.

California redwood is obtained from a huge tree, and this facilitates avoidance of the usual defects such as knots, sapwood, and centres, in sawing up into planks. The quality mostly used for general purposes is "prime clear," but it should be particularly noted that for vats there is a special quality which is higher even than "prime clear," namely, "tank grade." The chief point of difference is that "tank grade" planks are cut only from the lower part of the tree, where the grain is closest, and are completely free from all defects.

The most popular timber in this country for chemical work is pitch pine, but in view of the increasing scarcity of this timber in a quality sufficiently good for vatmaking, California redwood comes as a welcome alternative. Price compares favourably, and freedom from shrinkage and defects are special attractions not possessed by pitch pine.

The accompanying illustration shows a 20,000-gal. circular wooden vat, for hot water storage, recently installed by Carty and Son, Ltd., at the works of the Sun-Ray Dyeing Co., Leicester. The interest lies in the fact that it is not realised in this country to the same extent as in America that for water storage wooden vats possess advantages over steel. Wood tanks last much longer than do steel tanks; require no attention and do not have to be painted. In the case of hot water vessels, moreover, the heat is retained without the extra expense of lagging.



Circular Wood Vat, capacity, 20,000 gallons, recently installed by Carty and Son, Ltd., for the storage of hot water at the works of the Sun-Ray Dyeing Co., Leicester

are made of redwood in America, where its use for vats has extended over the last hundred years. The largest wooden

lost a substantial part of its business to Germany, while the United States maintained its position in the market.

THE importation of cresylic acid into Mexico advanced from 46,111 pesos in 1930 to 86,620 pesos in 1934, and the first ten months of 1935 amounted to 62,691 pesos. The United States was Mexico's principal supplier of cresylic acid in 1930 with 38,005 pesos, but in 1934 Great Britain forged ahead with 64,076 pesos and the United States only 22,529 pesos. In the first ten months of 1935, Great Britain

## Aluminium as Constructional Material for Containers

### Light Weight Attended by Good Strength

**A**LUMINIUM is now recognised as one of the most valuable materials for making containers for the transport, packing and storage of chemical and allied products. Aluminium of commercial purity has a high resistance to chemical corrosion, and can be used in many instances where other metals would fail. Such containers, when used for repeated transport, retain their pleasing appearance over a considerable life. Aluminium containers, when used for weight, and this is another factor of considerable importance. This saving in weight may mean an appreciable saving in transport charges.

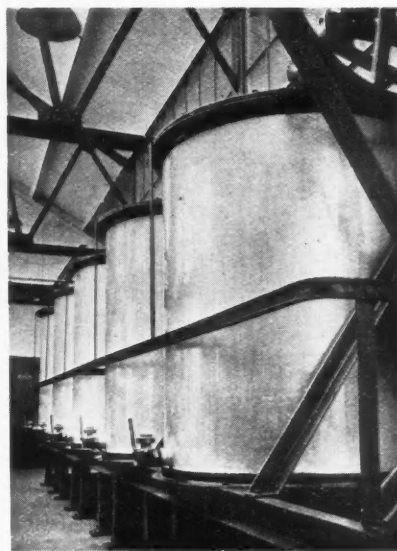
The aluminium container is in use over a very wide range. As an example it can be said that a box for toothpaste or

drums are fitted with either swaged or built-up steel reinforcing rings at ends and other danger points. This type of aluminium drum has been in use for several years, and is giving every satisfaction.

For storage in works, aluminium tanks are a standard feature, and it is difficult to specify all industries where aluminium storage vessels are used. As examples which come readily to mind we would mention aluminium tanks used for the storage of formaldehyde, in the manufactures of synthetic paints and varnishes, aluminium storage tanks for finished synthetic resins, shellac, and similar material used in this important industry. Aluminium is also adopted for the storage of many oils and fatty acids.



A novel form of Liquid Container (with screwed top) made of aluminium



Aluminium Storage Tanks at varnish works

cosmetics is probably the smallest pack made, while at the other end of the range storage tanks up to 10,000 gal. capacity are a regular product. The smallest containers made by the London Aluminium Co., Ltd., are essence bottles of 5 oz. capacity, and these bottles are made in graduated sizes from this minimum size up to 160 ozs.; also in certain larger sizes, notably 5 and 10 gal. capacity. Aluminium essence bottles are adopted as standard in many industries, as these containers are made as a one-piece spinning, and being seamless are assured of a long and useful life.

In the range of smaller containers there are also a large number of containers produced to meet the needs of some particular industry. For example, glue manufacturers require for export a type of container which will be non-fragile but sufficiently strong to carry the fairly viscous liquid, and at the same time will be cheap enough to be non-returnable. A simple cylindrical container was produced by this company in light gauge metal, fitted with a close push-on lid, the flange of which was sufficiently deep to stiffen the edge of the container. This gave a very satisfactory pack, which, before shipment, was sealed by adhesive tape. A somewhat similar container, but with a tapered neck and screw-on cap, is at present being tried for the transport of fruit juices from the Colonies.

For the transport of chemicals such as nitric and acetic acid, aluminium is almost universally used to-day. Drums of varying capacities are used, and since the metal is not itself strong enough to withstand the rough handling, the

Not only does aluminium in its commercial and higher purities resist very strongly chemical corrosion, but in addition, the salts of aluminium are colourless and non-poisonous, so that the use of the metal, from the standpoint of purity of product, is very important. When, in addition, it is remembered that the cost of an aluminium vessel is lower than that of stainless steel or glass-lined steel, and is comparable with that of other materials, it will be realised that the aluminium container is worth consideration.

### Plywood Barrels

WITH many years of manufacturing experience in packages of every description and for all classes of trade, W. Lusty and Sons, Ltd., find the most satisfactory type suitable for chemical powders, generally, to be plywood barrels.

As a special feature they have been making these barrels in a new and revolutionary style, which introduces many important features hitherto unaccomplished in a plywood barrel. This pattern is perfectly dust-tight, eliminating any form of cotton rope lining in the interior, which is clear of all obstructions, and furthermore there is no metal to come into contact with the contents. Actually it is an admirable type of packing for semi-liquids such as soft soap, and is capable of carrying powders of the finest mesh. Paper or linen linings which are often used can be in all probability eliminated, and if used cannot possibly get torn or caught inside.

## Rubber Linings for Tanks

### A Simple Form of Measuring Tank for Acid

NORDAC, LTD., claim to be the pioneers of the use of rubber on the site for lining tanks and vessels of all kinds. They have had a long experience of the effect

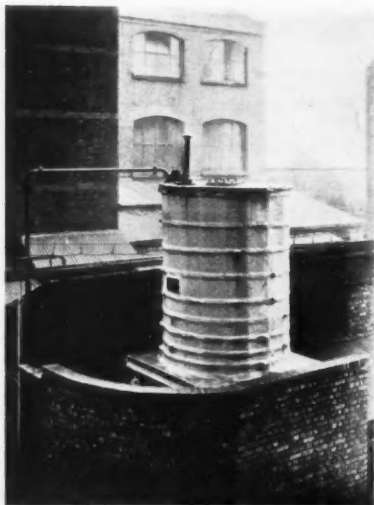


Fig. 1.—Acid Storage Tank constructed of Nordac patent rubber concrete

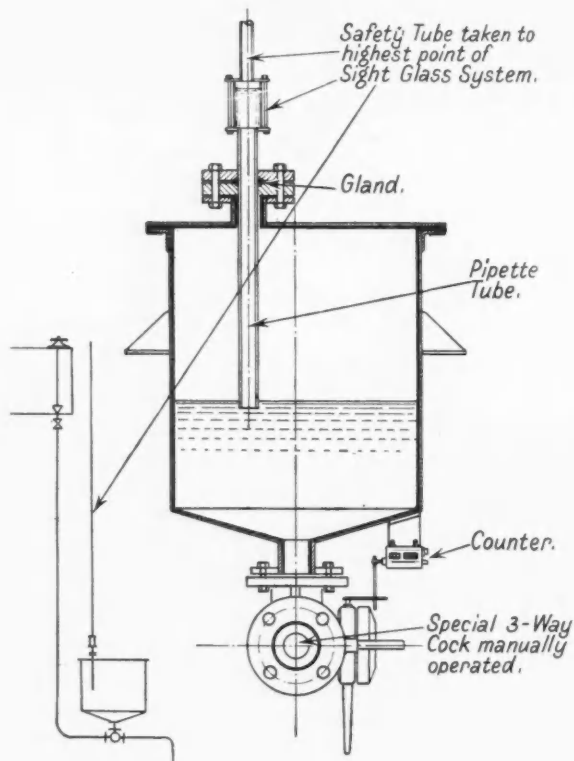


Fig. 2.—Measuring Tank for acid (Nordac, Ltd.)

of corrosion in practice, and have developed special means of avoiding the troubles usually associated with the storage of hydrochloric acid.

It is well known that fumes cause almost as much trouble as the acid itself, and to this end Nordac, Ltd., have

developed methods of constructing tanks whereby this trouble is avoided. Fig. 1 shows an acid storage tank constructed of Nordac patent rubber concrete which is acid resisting outside as well as inside. It is resilient, and therefore resists the stresses due to the changes of temperature, requires little maintenance, is not attacked by fumes, and is lined with rubber in the usual way. These tanks are completely equipped with pipes, valves, meters, and so on, so that no manual handling of the acid is required. Fig. 2 shows a simple form of measuring tank which has been developed to meet the case of a cheap appliance for measuring the acid by manual operation.

To meet the case of a rubber valve, to handle acid at high pressures, a special design is available to control the flow of acid in high pressure pipes. This valve stands 100 lb. per sq. in. The diaphragm is completely unpuncturable owing to the internal packing of discs and buffers. These allow sufficient movement for the opening and closing of the valve, but offer resistance to puncture or collapse.

### Kegs and Square Tapers

"P. T. L." kegs and square tapers are two of the specialties manufactured by Robinson and Co., Ltd. They are increasing in popularity, due to the attractive appearance as well as to utility and low price. Strength has been one of the main considerations, and both "P.T.L." kegs and the square tapers are so constructed that, although light, they are remarkably strong. Square tapers will carry almost any liquid, and can be fitted with narrow or wide necks, making them suitable for many purposes. In the case of the "P.T.L." kegs the biggest demand is for stiff paint, distemper and similar materials; but it is found that a special type of "P.T.L." keg is suitable for carrying ready-mixed paint, and this package forms a useful paint pot and is therefore appreciated by the user. In addition to these special lines, Robinson and Co. make all types of ordinary drums up to 50 gal. capacity, and their new factory is well equipped for production.

### Road Wagon Tanks

A MOST successful development of the container has been in the form of road wagon tanks for the transport of all kinds of liquids in bulk. One of the best known firms specialising in the manufacture of these tanks is John Bellamy, Ltd. The advantages of bulk transport of oils, spirits, tar products, etc., are finding increasing favour in the chemical industries, and this firm has made a study of every aspect of the subject. Their popular "Lyte-Wate" road wagon tanks were produced as a result of their initiative following the introduction of taxation based on unladen weight, and are supplied up to the largest sizes and designed specially to keep down taxati on costs by carrying a maximum load with a minimum weight at an attractive initial outlay. Up-to-date fittings, smart appearance and excellence in workmanship have established Bellamy's reputation in the road wagon tank field.

### Cotton Bags and Liners

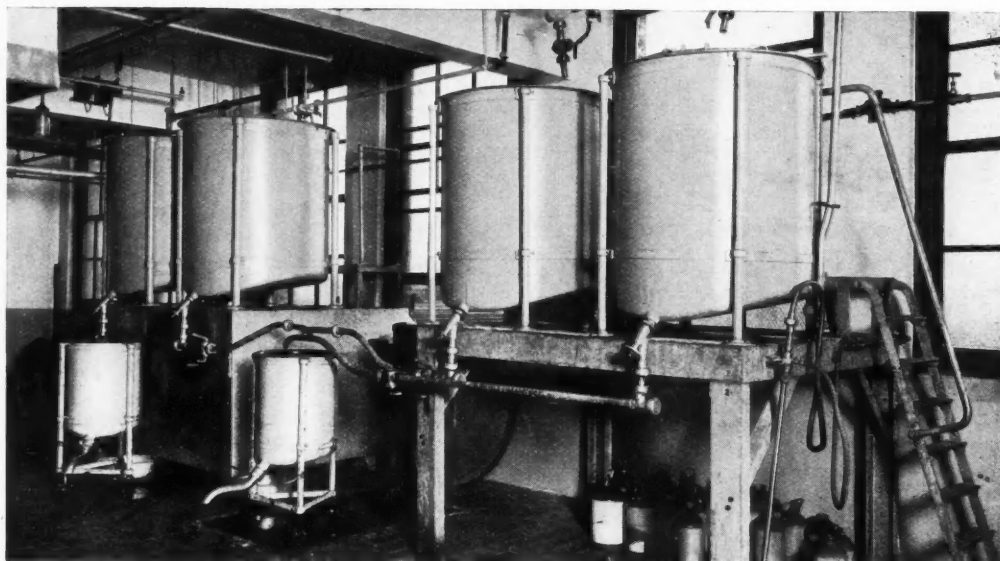
COTTON bags and cotton liners for any package and for all trades are supplied by W. H. Feltham and Son. As regards the chemical trade, they are certainly making many more liners than ever before, as there is a greater demand for purity and for avoiding contamination with outside covers of all forms. These liners and bags are made of bleached and unbleached materials, and, in the case of outside packages, the makers can print them in any colours or combination of colours.

## Glass Lined Storage Tanks

### A Standard of Cleanliness

GLASS has become the standard with which the cleanliness of other materials is compared. Consequently, "Pfaudler" glass lined tanks and equipment are to-day being used wherever their clean lasting glass lined interiors have been the means of reducing operating costs. So effectively can a

even for an entirely different product. Many manufacturing processes which were deemed satisfactory in wooden or metal vessels have been found to be more effective when carried out in glass lined equipment. The smooth glass lining affords no crevices in which harmful bacteria may



"Pfaudler" Glass-Lined Storage and Portable Tanks in the syrup room of a large London factory

glass lined tank be cleaned, that, if desired, the same tank can then be used for some other product without the characteristics of one affecting the other. For example, a tank that has been used for storing or mixing one mineral water flavour could safely be used after cleaning for another flavour, or

lodge and multiply. Cleaning a "Pfaudler" tank is easy, and does not acquire drastic scouring methods which gradually wear away less durable materials. "Pfaudler" equipment is now made in Scotland by Enamelled Metal Products Corporation (1933), Ltd.

## Fibreboard Containers

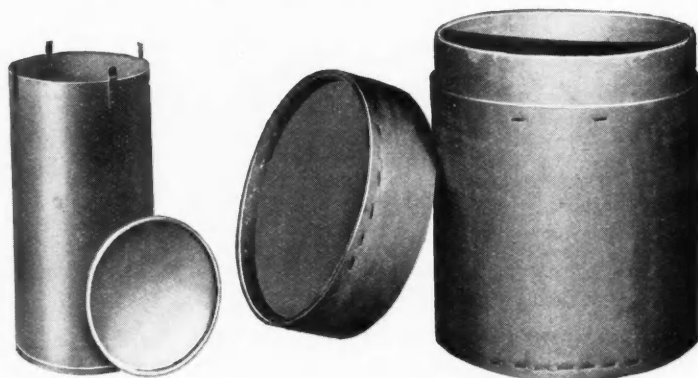
THE standard type "Uno" fibreboard containers supplied by Uno Products are made on a laminated principle which ensures great strength and solidity. They are fitted with

up against heat without any risk of joints opening, such as may be experienced with wooden barrels.

In these fibreboard containers the full aperture top affords easy removal of contents when being used, and the smooth inside surface prevents wastage in this respect. They can be treated internally and externally for various products, and are ideal for the carrying of caustic crystals and powders, etc. There are no splinters, nails, etc., used in manufacture and therefore all danger of such foreign matter getting into the contents is eliminated. No skill is required for the fastening of the lid and no cooping is required.

These "Uno" containers have been supplied to the chemical trade for the past twelve years and have given every satisfaction. They are built and constructed in accordance with the Railway Specification and are therefore carried at the company's risk.

The "All Fibre" Uno container is constructed on the same principle except that the heads are also fibreboard, and this is ideal when the contents to be carried must not in any way come into contact with metal. These containers are light, strong and dependable. The method of fastening the lids of this type is by the use of adhesive tape or paper.



Full Aperture Container

All Fibre Container

metal heads giving a full aperture opening at the top. The lid has a  $\frac{1}{2}$  in. deep dish which fits inside the fibreboard wall of the drum and thus ensures safety from leakage. The whole of the body is made without joints and therefore stands

## British Overseas Chemical Trade in July

According to the Board of Trade returns for the month ended July 31, 1936, exports of chemicals, drugs, dyes and colours were valued at £1,883,955, as compared with £1,761,223 for the corresponding month of 1935, showing an increase of £122,732. Imports were valued at £947,613, as compared with £898,994, an increase of £48,619. Re-exports were valued at £33,186.

	Quantities.		Value.			Quantities.		Value.	
	July 31,		July 31,			July 31,		July 31,	
	1935.	1936.	1935.	1936.		1935.	1936.	1935.	1936.
<b>Imports</b>									
Acids—					Drugs, medicines, etc.—				
Acetic .. cwt.	12,336	12,829	17,457	14,912	Quinine and quinine				
Boric (boracic) ..	1,000	6,500	1,573	6,616	salts .. oz.	103,616	41,534	7,950	3,937
Citric ..	1,349	2,347	5,459	9,239	Medicinal oils .. cwt.	4,058	4,028	10,542	10,833
Tartaric ..	5,687	3,785	23,974	15,511	Proprietary medicines				
All other sorts .. value	—	—	12,352	8,074	value	—	—	32,125	43,896
Borax .. cwt.	17,307	16,003	8,048	8,548	All other sorts ..	—	—	46,930	44,970
Calcium carbide ..	90,655	74,726	46,680	40,499	Dyes and dyestuffs and				
Fertilisers, manufactured—					extracts for tanning—				
Superphosphate of lime					Finished dyestuffs (coal				
tons	—	—	—	—	tar) .. cwt.	3,509	4,067	95,015	100,021
All other descriptions ..	1,902	2,974	7,151	12,857	Extracts for dyeing ..	4,541	5,931	11,935	11,825
Phosphorus .. cwt.	2,526	265	6,849	1,149	Extracts for tanning				
Potassium compounds—					(solid or liquid)—				
Caustic and lyes ..	13,386	10,857	16,219	11,138	Chestnut .. cwt.	28,102	23,385	19,379	15,294
Chloride (muriate) ..	47,042	60,100	15,673	21,994	Quebracho ..	36,365	11,489	21,878	9,028
Kainite and other min-					All other sorts ..	23,657	64,774	16,367	47,734
eral fertiliser salts ..	23,900	21,000	4,056	4,446	All other dyes and dye-	986	1,097	17,622	16,283
Nitrate (saltpetre) ..	17,088	6,040	10,661	4,956	stuffs				
Sulphate ..	14,640	25,608	5,561	11,403	Painters' colours and ma-				
All other compounds ..	9,575	14,045	14,076	22,323	terials—				
Sodium compounds—					White lead (basic				
Carbonate, including					carbonate) .. cwt.	7,482	9,001	8,720	11,875
crystals, ash and bi-					Lithopone ..	17,035	27,077	10,911	16,444
carbonate ..	124	15	42	11	Ochres and earth colours				
Chromate and bichro-					cwt.	47,506	21,986	15,263	8,096
mate ..	2,400	5,342	3,416	6,360	Bronze powders ..	1,827	1,534	12,705	10,592
Cyanide ..	2,000	4,143	4,989	9,936	Carbon Blacks ..	38,107	47,203	56,814	66,779
Nitrate ..	15,910	20	3,604	26	Other pigments and ex-				
All other compounds ..	22,649	23,822	13,973	19,289	tenders ..	34,620	40,238	9,790	10,404
Other chemical manu-					All other descriptions ..	15,325	13,924	31,529	28,256
factures .. value	—	—	250,788	252,158	Total .. value	—	—	898,994	947,613
<b>Exports</b>									
Acids—					All other sorts ..	63,996	69,717	77,549	76,836
Citric .. cwt.	3,367	4,189	13,640	17,840	Zinc oxide .. ton	903	1,388	16,269	25,031
All other sorts .. value	—	—	18,722	20,999	All other descriptions value	—	—	190,837	252,027
Aluminium compounds					Drugs, medicines, etc.—				
tons	6,594	6,491	69,666	59,461	Quinine and quinine				
Ammonium compounds—					salts .. oz.	135,751	225,215	12,925	21,920
Sulphate ..	28,371	18,731	176,124	111,438	Proprietary medicines				
All other sorts ..	3,432	1,607	35,312	16,526	value	—	—	107,085	98,442
Bleaching powder (chloride					All other descriptions ..	—	—	133,451	145,873
of lime) .. cwt.	51,108	64,084	13,297	16,922	Dyes and dye-stuffs and				
Coal tar products—					extracts for tanning—				
Cresylic acid .. gal.	116,400	246,733	10,371	29,405	Finished dye-stuffs (coal				
Tar oil, creosote oil,					tar)—				
anthracene oil ..	1,662,121	1,682,719	43,120	41,182	Alizarine, alizarine red				
All other sorts .. value	—	—	13,009	18,214	and indigo (syn-				
Copper, sulphate of tons	1,663	2,108	23,042	28,690	thetic) .. cwt.	2,852	2,223	14,746	13,101
Disinfectants, insecticides,					Other sorts ..	5,380	6,901	76,849	98,022
weed killers ..	26,205	38,682	61,933	75,429	All other descriptions ..	21,497	23,938	26,498	26,514
Fertilisers, manufactured					Painters' colours and ma-				
tons	4,784	3,888	22,151	21,137	terials—				
Glycerine .. cwt.	10,141	11,849	24,240	27,123	Ochres and earth colours				
Lead compounds ..	11,637	12,751	14,023	17,343	cwt.	16,144	16,132	16,994	13,868
Magnesium compounds					Other descriptions ..	18,035	24,392	27,981	38,169
tons	482	480	10,839	11,470	White lead ..	6,173	8,016	12,292	15,711
Potassium compounds cwt.	8,095	6,074	11,714	8,941	Paints and painters' ena-				
Salt (sodium chloride) tons	16,856	32,391	48,888	84,318	mels, prepared or				
Sodium compounds—					ready-mixed ..				
Carbonate including					crystals, ash and bi-				
carbonate .. cwt.	384,717	349,551	91,104	82,487	carbonate .. cwt.	41,763	48,862	106,786	133,454
Caustic ..	184,556	173,107	97,315	88,857	Varnish and lacquer				
Nitrate ..	18,046	16,287	5,933	5,495	(clear) .. gal.	76,744	72,137	31,585	30,600
Sulphate, including salt-					Printers' ink .. cwt.	4,302	3,529	26,385	24,972
cake .. cwt.	70,222	15,681	5,884	1,819	All other descriptions ..	35,631	39,726	72,574	84,319
Chemical manufacturers					Total .. value	—	—	1,761,223	1,883,955
and products .. value	—	—	20,213	16,283	Painters' colours and ma-				
Drugs, medicines and medi-					terials .. cwt.	1,034	563	2,099	986
cinal preparations ..	—	—	10,174	15,471	Total .. value	—	—	36,934	33,186
Dyes and dye-stuffs and									
extracts for tanning cwt.	727	247	4,448	446					

## Industrial Accidents and Poisoning

### A Notable Increase Reported by the Chief Inspector of Factories

**A**CCORDING to the annual report of the Chief Inspector of Factories and Workshops, for the year 1935 (H.M. Stationery Office, price 2s. net), there was again a considerable increase in the total number of accidents reported, the number being 149,696 including 843 fatalities in 1935, as compared with 136,858 including 785 fatalities in 1934. Compared with 1933 the total accidents increased by 32 per cent. and the fatal accidents by 22 per cent. "This," states the report, "is a regrettable, but usual, accompaniment of improving trade."

#### Explosions

Fifty-nine accidents, including two fatal, occurred during the year in connection with the use of acetylene. One of the fatalities emphasised the importance of removing all traces of unspent oxide and residual gas from a generator when it is intended to leave it standing empty for a period, even when no repairs are contemplated. Unless the generator can be opened up, washed out with water by a hose and left open to the atmosphere until again required, it should be filled completely with water, care being taken to ensure that no gas remains trapped. Many of the other accidents would have been prevented if there had been full compliance with the recommendations in the Memorandum on Safety Measures Required in the Use of Acetylene Gas (Form 1704, price 2d.).

Several accidents, including one fatality, were caused by the explosion of drums or tanks which had contained petrol or other inflammable liquids during welding or soldering operations, owing to neglect of the precautions recommended in the official leaflet (Form 1,926, price 1d.) to ensure the removal of all residual vapour.

#### Water Sealed Gasholders

A serious burst of the crown plates of a water-sealed gasholder occurred at Barrow-in-Furness early in the year. The burst was accompanied by ignition of the large volumes of gases which escaped as the lifts collapsed, and scorching of the painted surfaces and other material in the vicinity indicated the possibility of serious injury by burning to any person who might have been within range of the fiercer part of the flames. Fortunately, however, no person happened to be in that neighbourhood, and the only person injured (slightly) was a man in an adjoining street. Examination of the crown plates of the holder, after the burst, indicated very deep internal corrosion and consequent weakening of the plates, the burst being without doubt due to this cause.

This explosion has prompted inquiry as to: (1) The possibility of determining the internal state of plates of gasholders by new methods not involving entry; and (2) how far the recommendations made in 1932 by the Institution of Gas Engineers to gas undertakings, on the periodical inspection of gasholders, are being observed. As to (1) it was found that methods of examination are being developed by which it is likely that the states of the internal sheeting of gasholders can be determined without entry; such methods, if proved successful, will be very helpful indeed towards ensuring the safety and reliability of water-sealed gasholders. As to (2) it was found that whilst a number of the larger undertakings are carrying out periodical inspections, many of the medium sized and smaller undertakings cannot yet be said to be in a satisfactory position on this point. A meeting with representatives of the Institution, has, however, been held, and the matter is being further pressed.

The number of waterless gasholders in the country is still comparatively small. It is, however, believed that undertakings which have installed this type of gasholder are

carrying out the recommendations framed by the Factory Department in consultation with the Institution of Gas Engineers.

The number of explosions of air receivers and other vessels containing compressed air (*e.g.*, paint spraying tanks, oil service tanks, etc.) and of steam receivers, still remains unnecessarily high. Investigation of these bursts indicates that if the precautions frequently recommended by this Department as to the installation of receivers and vessels of proper construction, periodical examination by a competent person, and the use of safety fittings (*e.g.*, proper safety valves and where necessary reducing valves) were adopted, the numbers of these bursts would be greatly reduced.

#### Fire Precautions

Fire brigades, often well equipped and thoroughly efficient, exist in many large works. The proportion of works in which there is fire drill, in the sense of periodical tests of the rapidity with which the workers can leave the premises on an alarm being given, is not high. There is some difference of opinion as to the desirability of such drills. Whilst some employers consider them of great value, the responsible safety officers of certain large works are reported to regard them with disfavour as tending to lead to panic, shock to sensitive persons, and dislocation of work out of proportion to the benefit. They prefer to rely on full instructions to persons in supervisory posts as to the action to be taken in case of fire.

The value of a good sprinkler system was demonstrated by a fire at a large flour mill which was overcome immediately by the water from the sprinkler jets. An unusual fire-fighting device is provided in the benzol department of one chemical works. It consists of a methyl bromide extinguisher operated by a weight. The weight is released either automatically by the fusion of a plug of a low melting point alloy in a wire supporting it, or by operating the wire by hand. The bromide is then conveyed by pipes to nozzles bearing on strategic points such as manholes and joints.

Among fires which have been selected for mention from those reported, owing to their fatal results or other points of interest rather than their magnitude, are:—

(1) The destruction of a factory by a fire which broke out at a plant for degreasing glove leather. The skins were soaked in petrol and afterwards passed through a mangle. Sudden ignition occurred at the latter and was probably due to static sparking. The precautions suggested for the future were artificial humidification of the air in the process room, earthing of the whole plant, and provision of automatic extinguishers over the soaking tanks.

(2) The accidental displacement of a screw plug at an oil cracking plant resulted in the escape of a large quantity of inflammable liquid under pressure. The vapour was finally ignited, probably by a furnace twenty yards away at the other side of a matchboarding partition. Two men whose clothing had been saturated by the liquid in trying to stop the leak were burnt to death. This case illustrates the advisability of separation of any places where such accidental escapes may occur by impervious walls from all possible sources of ignition.

#### Safety Organisations

The value of any system of accident prevention can be assessed by a comparison of the frequency rates over successive years. This rate (*i.e.*, the number of accidents per 100,000 man-hours worked) is a true quantitative measure of simple accident incidence, though it takes no account of the severity of the accidents incurred.

The nature of safety organisations varies considerably. The organisation usually includes a safety committee, but in some cases there is only a safety officer, and in some works this officer's duties are not confined entirely to safety work. Many of the committees include direct representatives of the workers, but others are limited to representatives of the management, works engineers and foremen. The reports received show that the majority of the committees are live organisations doing good and sometimes invaluable work, but in a few cases their work is perfunctory or worse. At one large engineering works no pains were taken to hide the fact that the safety committee was a farce; it was stated that it sat only once a year and never had anything to suggest. At another large works, no recommendation by the committee which had been implemented by the management could be pointed out, and the general result of the investigation of an accident appeared to be merely an opinion that the injured person was "careless."

#### A "No Accident" Flag is Hoisted

Such cases are exceptional, and are quoted only to emphasise the fact that personality and driving force in those who take the lead, and a sympathetic attitude of the management are essential factors in the success of safety committees. A good feature of the work of some of the committees, which might usefully be adopted more generally, is the periodic inspection of the works by the committee or some of its members. If properly carried out, this should enable the risks attending the various operations to be considered in some detail on the spot, and limit any tendency of the committee to deal too much in generalities.

Good work and progress by many of the previously existing safety organisations is also reported. At a group of chemical works employing 8,000 persons the accident frequency rate, which has declined fairly steadily, fell in 1935 to 1.33, the lowest figure for six years past. At a very large oil refinery so many matters connected with safety came before the Safety Committee that it was found necessary to appoint three sub-committees to consider (1) processes and safety, (2) ambulance work and accident treatment, and (3) fire. The sub-committees report to the main committee, which then comes to a decision on the recommendations made by the former. Precautions against gassing and overstrain due to the lifting of weights are matters to which special attention has been given at this works.

At each of the twenty works of a large cement manufacturing combine a "no accident" flag is hoisted on the completion of a full week without a lost-time accident. On the occurrence of such an accident the flag is hauled down and not re-hoisted until a full week has again passed without an accident. Inquiries as to the reason for the flag being lowered show that this scheme is having the intended effect of stimulating interest in accident prevention amongst the workers.

#### Cellulose Solutions Regulations

Many of the requirements of this new Code had already been complied with as the result of the recommendations made for some years past, and a fairly good standard of compliance has been attained. A number of exemption certificates have been issued in suitable cases permitting, for example, sliding doors in place of doors opening outwards, single exits from very small spraying rooms, the absence of separation of places which are only technically "cellulose spaces" from other parts, and the absence of mechanical ventilation where the use of the solutions is confined to limited and intermittent brush application.

There has been frequent and useful co-operation with the local authorities responsible for the administration of the Petroleum (Consolidation) Act, 1928, and many cases have been brought to their notice in which the necessary licences under the Act have not been applied for.

There is considerable scope for better compliance with Regulations 11 and 12 as to the limitation of stocks in rooms in which the solutions are used to a single day's requirements, keeping such stocks in metal cupboards or other equally safe

receptacles when not in actual use, and closing empty cans and removing them to a safe place. After the structural requirements of the regulations have been complied with, it is largely on the proper observance of simple requirements of this kind that safe working depends.

#### Dangers from Electrical Equipment

The number of situations where the use of electricity in factories is required under conditions which may be inflammable increases each year. New factories for the manufacture of solvents have been erected, and there have been questions of use in the vicinity of carbon bisulphide and coke-oven gas. Difficulty arises because no flameproof enclosures have been certified as safe in these cases. It is commercially impracticable to certify apparatus in respect of each and every inflammable gas, and the Department has therefore considered, in consultation with the Mines Department, the possibility of group certification. Research on the subject has been arranged through the medium of the Electrical Research Association, and is being conducted at the Safety in Mines Research Station. It is hoped that it will be possible to divide the inflammable gases into not more than four groups, and that makers will be able to fix a permanent label to apparatus marked with both the group and certificate number.

Research has also been arranged at the National Physical Laboratory as to the conditions under which explosions or fires in dry cleaning establishments can be caused by static electricity. In addition some experiments have been carried out with the assistance of technical colleges with the object of ascertaining whether static discharges were capable of igniting cinematograph film shreds or punchings. The tests were severe compared with the conditions likely to obtain in a factory process, both as regards duration of the spark and the energy discharge, but in no case was ignition obtained.

(To be continued.)

## Sulphur Recovery Processes

### A New I.C.I. Company

A NEW company is being formed by Imperial Chemical Industries, Ltd., and Bolidens Gruvaktiebolag, Sweden, for the joint exploitation of the processes developed by the two companies for the manufacture of sulphur and liquid sulphur dioxide from the sulphurous gases evolved in metallurgical operations such as the roasting and smelting of sulphide ores. The processes of the two companies are essentially different, but together cover such a wide field of application that there are very few problems, connected with the disposal of sulphurous gases, which cannot be solved technically in a satisfactory manner by one or other of the processes.

The processes controlled by the new company, Sulphur Patents, Ltd., offer a means for the production of elemental sulphur or liquid sulphur dioxide from pyrites or similar materials. By their use the nuisance arising through the discharge to atmosphere of gases containing appreciable concentrations of sulphur dioxide can be reduced or, if desired, entirely eliminated. Under average conditions this elimination of a nuisance is achieved with the production of sulphur, or liquid sulphur dioxide, at a cost which shows a reasonable return on the capital expenditure required for the erection of the plant. The two main processes are:—

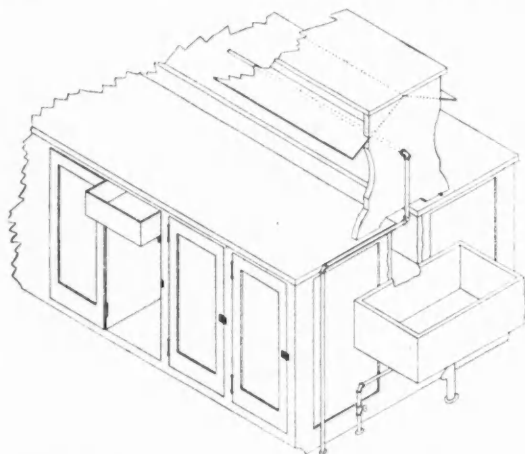
(1) The process developed by Bolidens G.B. for the direct recovery of sulphur from raw gas, and used by them in their smelter at Rönnskär, Sweden, where 20-25,000 tons of high quality sulphur are produced annually. (2) The I.C.I. processes of sulphur dioxide concentration followed by liquefaction of the sulphur dioxide or reduction to elemental sulphur, the concentration process being used by the Outokumpu Co. in their copper smelter at Imatra, Finland, where a plant having a designed capacity of 52 tons per day of liquid sulphur dioxide was put into operation during the early part of 1936.

## The Chemical Laboratory Bench

### Means for the Removal of Vapours

**A** NEW laboratory for general chemistry, recently completed at the Virginia Military Institute, Lexington, Virginia, embodies several features which have proved their worth in actual experience.

The laboratory, with connecting offices for the instructors, is housed in the top floor of a building recently completed,



Laboratory Bench at the Virginia Military Institute, showing hood for removal of fumes and vapours.

adjacent to the chemistry building and connected to it through an enclosed corridor bridging a space of some 25 ft. The laboratory proper is a room 86 by 40 ft., lighted on three sides by large casement windows, and having a nearly vertical skylight running almost the length of the room. Ventilation of the room itself is provided for by two Univent radiators at opposite corners. In addition to the windows the whole skylight may be opened in good weather. The room is completely fireproof, with white painted brick walls and concrete floor.

The benches were designed to provide locker space for four individual sets of apparatus under each working space, to

accommodate four different sections on successive days. Each cupboard has a built-in drawer, such that one catch serves to lock both drawer and locker, thus making for economy in construction and use as well as neatness of appearance. Tops are of alberene stone, purchased in rectangular sections and sawed to shape. These benches are in three sections of eight units each (unit is 5 ft. 6 in. in length) and three of four units each, providing working space for seventy-two men.

Each bench is provided with water and gas lines, the latter being run as a continuous pipe through the reagent-shelf supports. Instead of individual sinks, a lead-lined trough was built running the length of each section and sloping to one end. At proper intervals an offset in the trough furnishes a sink beside each work space, and all drain into a large sink with a 2½ in. drain at one end of the section. The eliminator of many hidden drains makes for simplicity of plumbing, but more important, minimizes clogged drains, which are encountered all too frequently. The one pipe to the sewer is easily accessible for repairs.

Ventilation and the elimination of vapours is provided for through the medium of flumes along the top of each section, three sides being in California redwood heavily coated inside and out with alphasum and "Troplite," the bottom consisting of a wedge-shaped metal strip extending as an apron 8 in. out over the bench (see drawing). At the vertex the metal is pierced with from six to ten ¼ in. holes (depending on the distance from the centre (to admit gases to the flues. Each section of this trough is connected through a sheet-metal flue which is exhausted by a 3 ft., Buffalo-type C-L fan driven by a 750 r.p.m. 1 h.p. motor.

This arrangement has proved very satisfactory for the elimination of the greater part of the fumes created by the students at each unit. For example, phosphorus can be burned in an evaporating dish held several inches below the metal apron with almost complete removal of the phosphoric oxide fumes. This arrangement works much more satisfactorily than most of the down-draught hoods usually provided for, and is superior to most overhead hood arrangements in that it is neat and compact and decreases visibility and light very slightly. The top of the flume serves as a shelf for bottles, and takes up very little more space than the conventional type of reagent shelf.

## International Nickel Co. of Canada

### Increased Profit in June Quarter

A NET profit of \$9,070,186, equivalent to 59 cents per share on the common stock after allowing for preferred dividend, is reported for the second quarter of 1936 in the quarterly statement of the International Nickel Co. of Canada, Ltd. This compares with a net profit of \$8,386,787 for the first three months of the current year, which was equal to 54 cents per share. Net profit for the first six months of 1936 was \$17,456,974, as compared with \$10,338,242 for the first half of 1935. The consolidated balance sheet at June 30 shows current assets at \$69,375,431, including \$40,653,863 in cash and government securities. These figures compare with current assets of \$60,109,935, including \$32,720,024 in cash and government securities, at December 31, 1935. The total of earned and capital surplus now amounts to \$112,908,128.

Mr. Robert C. Stanley, president, in a letter to shareholders, states that the company is producing and marketing eleven different metals from ores which fifty years ago "were notorious for their refractory character." These metals are

nickel, copper, gold, silver, platinum, palladium, rhodium, ruthenium, iridium, selenium and tellurium. "With the exception of gold and silver which have already established markets," Mr. Stanley continues, "these metals are winning acceptance in industry and in the arts and sciences as the result of research and development activities directed along the lines which have proved successful in the case of nickel. Statistics of the past year indicate a general increase in the use of copper throughout the world and especially in markets served by the company. Progress is being made with the platinum metals in the production of acids and rayon, in the improvement of dental gold alloys and in the wider use of rhodium finishing in the jewellery and allied trades, including the "rhodanising" of silver. Selenium is an accepted material in the glass industry and in certain branches of rubber manufacture, and tellurium is also receiving industrial attention. Nickel remains the most important product industrially."

## Personal Notes

MR. DAVID ALEXANDER BLAIR, of Clevedon Drive, Glasgow, chairman of Blairs, Ltd., who died on April 24, left £106,419.

MR. JOHN MCCUBBIN, Greenock, has received an appointment as sugar factory chemist in India.

MR. J. P. BEARD, a departmental manager at the factory of Boots Pure Drug Co., Ltd., at Nottingham, has died. He had been with the company over forty years.

MR. THOMAS SHEDDON, B.Sc., D.Ph., of Prestonpans, has received an appointment on the staff of I.C.I., Ltd., at Liverpool.

Alderman A. R. NORMAN died at his residence at Heath Road, Runcorn, last week in his 75th year. He became associated many years ago with the chemical and sanitary pottery firm of Thomas Norman, of Widnes. Later he became partner with his brother in that firm and he was also chairman of Parkinson's (Letchford), Ltd., tanners. He had been a magistrate for forty years, and upon the death of his brother, Sir Frederick Norman, a few weeks ago, he was appointed chairman of the bench.

PROFESSOR PARRAVANO, of Rome, is the president of the twelfth International Conference of Chemistry, which opened at Lucerne on Monday.

MR. T. W. SMITH, manager of the Patent Department of Canadian Industries, Ltd., has been elected president of the Canadian Chemical Association at the annual convention at Niagara Falls.

MR. WALTER GEOFFREY JACKSON, of Prestwick, Chiddingfold, Surrey, director and late chairman of Henry Briggs, Son, and Co., of Whitwood Collieries, Normanton, Yorks, and of Henry Briggs, Son, and So. (Trust), Ltd., and for many years chairman of the Whitwood Chemical Co., Ltd., who died on May 17, left £171,754, with net personalty £162,561.

MR. O. M. BRIMBLECOMBE, of Lawry, Hawke and Co., Ltd., fertiliser manufacturers, Kelly Bray, Callington, was killed on Sunday when the car he was driving, on his way to Neath for his holiday, came into collision with a motor bus in which a band was proceeding to Cardiff for a broadcast engagement at the West Regional station. He leaves a son who is at present on a cruise with a party of schoolboys.

## Chemical Notes from Foreign Sources

### Austria

FOR THE FIRST TIME IN FIVE YEARS the Skoda-Wetzler Powder Works is able to declare a dividend (5 per cent.), having achieved a net profit in 1935 of 605,000 schillings. Among new products now manufactured are phosphoric acid and phosphates.

### Czechoslovakia

A PROVISIONAL GOVERNMENT PERMIT for establishment of the Organochemica Co., in Prague has recently been granted to Director Patočka, of the Nestomitz Sugar Refinery, in association with the Bohemian Union Bank, the capital involved (reports the "Chemische Industrie") being six million kronen. The objects of the company are the production of hitherto imported medical and pharmaceutical specialities on a salicylic base (pyrazoles). Several existing pharmaceutical factories are to be taken over by the new company and a common sales office will be centred in Prague.

### Hungary

A NEW COSMETICS FACTORY to produce toilet soaps and perfumes is being built in Budapest by H. Baeder, a former member of the Parfumerie-Fabrik Baeder A.G.

THE RAAB ALCOHOL FACTORY, at Gyor, is embarking upon the manufacture of potassium sulphide and pure potassium carbonate.

### Japan

ABOUT 2,400 TONS OF AGAR-AGAR were produced in 1935 according to a consular report, over one-half of which (valued at about 4 million yen) was exported.

THREATENED BY A PRICE-CUTTING WAR in consequence of over-production, nine firms engaged in transparent paper manufacture have formed a cartel; one of the first decisions of which was to cut down production by 30 per cent. Cartel offices established in Tokio, Osaka and Nagoya will centralise the purchase of raw materials for the member firms.

### Manchukuo

WITH A CAPITAL OF 500,000 YEN the Manchurian Explosives Co. (Manshu Enka I.Y.K.) has been formed with the object of catering for the entire requirements of Manchukuo and Northern China (totalling about 5 million yen annually).

### Denmark

THE ASSOCIATION OF SLAUGHTER HOUSES OF NORTH JUTLAND (Nordjydske Andels-slagteriers Fabrikker) is planning the erection of a blood albumen factory at a cost of 170,000 kronen.

### France

ACCORDING TO A REPORT IN THE GERMAN PRESS the French paper-making concern, Papeteries de Strasbourg, is increasing its share capital from three to five million francs with a view to embarking upon the production of cellulose at the Strassburg Rhine Harbour.

RECENT COMPANY FORMATIONS include La Glyco-Sina, in Paris, with a capital of 1 million francs (utilisation of residues from the sugar industries); Société d'Applications pharmaco-dynamiques, in Paris, with a capital of 500,000 francs (chemical and pharmaceutical products); Parfumerie Royale, in Paris, with a capital of 300,000 francs (beauty preparations).

### Jugoslavia

EXTENSIVE ROCK SALT DEPOSITS estimated to contain five million tons salt have been located in the vicinity of Tuzla, near Sarajevo.

### Russia

SUPPLY OF SALT FOR INDUSTRIAL PURPOSES in the Far Eastern territory of the Soviet Union is to be assured by the exploitation of the rock salt deposits recently discovered in the Nordvik Cape area. Twelve million roubles have been allotted by the Government for necessary research and constructional work, and it is hoped to start up the first plant in 1938 with an annual capacity of 150,000 tons.

FERTILISER production in the Irish Free State rose in 1934, according to a recently published census report. Output of superphosphates and mixed fertilisers increased to 103,263 long tons (from 93,591 in 1933); basic slag 708 tons (from 480); tankage 297 (244); sulphuric acid 2,597 (2,158), and bone meal 111 (212 tons in 1933). Other unclassified products of the fertiliser industry rose in value to £33,469 from £27,554 in 1933.

## From Week to Week

TWO CEMENT FACTORIES are to be set up in the Free State by a Danish firm. The new venture has a capital of £300,000, and production is expected before the end of the year.

THE INTERNATIONAL COMMISSION FOR UNIFORM METHODS OF SUGAR ANALYSIS will hold their ninth session in London from August 31 to September 5 at the rooms of the Institute of Chemistry.

IN CONNECTION WITH THE JAPANESE PLAN to increase the nation's liquid fuel supplies for the purposes of defence, industry and finance, work is to be started as a Government undertaking with initial funds amounting to 10,000,000 yen (approximately £583,000).

ORDERS HAVE BEEN GIVEN at Dalzell Steel Works, Motherwell, to prepare every available steel melting furnace for operation. Dalzell works is the main Colville plant, producing as much as any other two steelworks in Scotland. Thirteen open hearth melting furnaces are now in active commission and production is running at about 10,000 tons a week.

THE GUNPOWDER WORKS AT ROSLIN, near Edinburgh, controlled by I.C.I., Ltd., are not to be closed down, as indicated early this year. Several months ago production of gunpowder at the explosive works was brought to a standstill and only a skeleton staff retained. Within the past few weeks production has increased and large numbers of workers have been re-engaged.

CONFIRMATION HAS BEEN GIVEN regarding the proposed offer by Powell Duffryn Associated Collieries, Ltd., to purchase the shares of British Briquettes, Ltd. There are 1,000,000 7 per cent. cumulative preference shares and 960,608 ordinary shares, each of £1 fully paid up, and Powell Duffryn is offering 11d. for each preference share and 1d. for each ordinary share. The offer is subject to acceptance by August 26 or by a later date as Powell Duffryn Associated Collieries may decide. It is also subject to acceptance by holders of at least 90 per cent. of each class.

NOW THAT WORK IS BACK TO NORMAL at the British Aluminium Co.'s Lochabar factory, it is expected that the contemplated extension of the factory will be undertaken soon and that the extension of the water power area which has been mapped out will follow automatically. In the projected waterworks extension, the company have authority to build a reservoir 800 feet long across the upper waters of the River Spey. This will be the third and final stage of the water power development scheme undertaken in the Western Highlands.

THE BOARD OF TRADE has received an application under Section 5(5) of the Finance Act, 1936, for a licence to import a cataphoresis apparatus of the type known as the Theorell cataphoresis apparatus. Any representations that similar apparatus is made or is likely to be made within a reasonable time in the United Kingdom or elsewhere in His Majesty's dominions, should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, not later than September 13.

IMPERIAL CHEMICAL INDUSTRIES, LTD., and Cooper McDougall and Robertson, Ltd., are arranging to pool their resources in the manufacture and distribution of insecticides and fungicides for the control of pests and diseases on plants. The object of this co-operation is to enable the two companies to offer a wider range of products and a more extensive service to the public. The arrangements will make available to Cooper, McDougall and Robertson, who have for many years been the leading company in this trade in the British Empire, the very large productive capacity of the I.C.I. factories. It will further result in the pooling of the research work carried on by I.C.I. in their chemical laboratories and at their biological station at Jealotts Hill, and also the field research carried out by C.M.R. at Yalding.

THE BRITISH OXYGEN CO.'S Caledonian Power Bill is to be re-introduced to Parliament. It will be recalled that the House of Commons rejected the Bill last March. Expenditure of £2,500,000 is envisaged in the scheme. The rejected Bill proposed to incorporate a company to be called the Caledonian Power Co. to generate electricity by water power in the counties of Inverness and Ross and Cromarty, and to supply electricity for power and lighting. The Bill provided that the power "shall be supplied mainly to the British Oxygen Co. for utilisation for the purposes of an electrochemical undertaking to be established near Fort William within the company's area of supply." The first directors of the Caledonian company were to be members of the British Oxygen Co. The company stated last February that the power was to be carried to a factory where carbide would be manufactured. The directors were of opinion that a great economy would be effected by the company itself manufacturing carbide used by it in the manufacture of acetylene. The whole of the company's carbide requirements are at present imported.

IN A NOTICE TO SHAREHOLDERS sent out by the Watende Mines (Kenya), Ltd., it is revealed that the company has acquired the lease of the Parc Lead Mines, near Llanrwst, North Wales.

A FURTHER RESTRICTION OF THE USE OF LEAD for industrial purposes has been ordered by the Controller of Base Metals at Berlin. Lead colours for outside painting must in future not contain more than 8 per cent. of lead.

IT HAS BEEN RUMOURED ON THE CONTINENT, particularly in Paris, that a new international platinum cartel will be formed in the immediate future. These rumours follow a marked revival in the demand for platinum in recent weeks, in the course of which the price has been raised from 140s. to 160s. per troy ounce.

THE FIRST PLANT IN CZECHOSLOVAKIA for the production of synthetic oil will be erected near Moravska Ostrava. A committee, including representatives of the biggest Czechoslovakian mining and railway companies, has been formed in order to find the necessary capital, which will amount to 120 millions Czechoslovakian crowns (£1,000,000).

THE TREASURY has made an Order under Section 10(5) of the Finance Act, 1926, continuing the exemption from key industry duty till December 31, 1936, of a long list of scientific instruments, compounds of rare earth metals, chemicals, analytical reagents and other fine chemicals, chemicals manufactured by fermentation processes, amorphous carbon electrodes and vacuum tubes for X-ray apparatus.

VISITING THE MONSANTO CHEMICAL WORKS at Acrefair, on August 17, for the purpose of inspecting certain plant, Mr. Norman Stewart Youngson, aged 30, of Oakdene, Glendyke Road, Calderstones, Liverpool, received fatal injuries. It was stated that a plug blew out of the apparatus he was testing, causing burns on the face, arms and legs. He was admitted to Wrexham hospital, where he died shortly after admission. Mr. Youngson had been in the service of the Audley Engineering Company, Newport, Shropshire.

IN HULL COUNTY COURT on August 13, Judge Sir R. Mitchell Banks, K.C., awarded Frank Sanderston Dalton, a chemist's assistant, £50 damages and costs against the British Gas Light Company, Ltd. Mr. Dalton, who was injured by a gas explosion, said that a man from the gas company was called to remove an old meter. After the man had left there were complaints of a smell of gas, and he went to the meter cupboard to investigate. He was not carrying a light, but as soon as he opened the door there was an explosion.

THE FIRST SUGAR FACTORY IN GRENADA, the southernmost of the British West Indian possessions, has just started production. The factory, which was built by Mirless Watson Co., Ltd., has a grinding capacity of 8 tons of cane per hour, and is notable because, though comparatively small, it is thoroughly efficient and up to date from the technical and economic aspects. The Governor-General of the Windward Islands, in granting a protective tariff to the new industry, stipulated that the sugar must be sold only in the local market, so as to prevent any dislocation of the sugar trade in the neighbouring islands.

SEVERAL EMPLOYEES HAD AN ALARMING EXPERIENCE at Whitehaven on August 19, when a slight explosion, which was followed by a fire, occurred in the laboratory at the Lowca by-products works of the United Steel Companies. Tom Sewell (32), a chemist, and T. McMellon (17), apprentice chemist, both of Moresby, were distilling tar when the explosion occurred, and so rapidly did the flames spread that their escape by the only door in the room was cut off. Hearing their cries for help, Richard Briggs, the chief chemist, who was in an adjoining room, attempted to reach the men through the door, but was driven back by the flames and fumes. Meanwhile Sewell and McMellon escaped through a window. As the fire spread to the vestibule, which is on the ground floor, 14 pay clerks who were working in an office had also to be rescued through the windows.

PRICE, STUTFIELD AND CO., LTD., sole representatives of the "Acticarbene" activated carbons and process of solvent recovery, inform us that the whole of the activities of the Societe de Recherches et d'Exploitations Petroliferes have been re-acquired by the parent company, Carbonisation et Charbons Actifs, 50 bis Rue de Lisbonne, Paris, 8e. The technical and administrative staff remains unchanged, and the representation in this country is unaltered. Carbonisation et Charbons Actifs, is a constituent of the powerful Empain group, supported by Ets. Kuhlmann, and the president is Monsieur R. P. Duchemin. The "Acticarbene" organisation is thus further consolidated and strengthened. Price Stutfield and Co., Ltd., report rapidly increasing business, many solvent recovery plants being in construction in this country. Carbonisation et Charbons Actifs have also acquired the processes of the Societe Industrielle d'Applications Electriques, and are now able to supply plants for the electric precipitation of dusts and mists operating by these unique methods. Price, Stutfield and Co., Ltd., will also deal with all inquiries for precipitation of dusts and purification of gases by these methods.

AN EXPLOSION causing the death of one man and injuries to another occurred on Monday, at the premises of the Atlas Oil and Tallow Refinery in Naylor Street, Liverpool, owned by James Crean and Sons, Ltd. The dead man was Frank Harlock, 24, fitter, who had been married only a few months and who lived at Bootle. The injured man is Richard MacGibbon, 46, fireman at the works, whose home is in Burlington Street, Liverpool. After hospital treatment for a severely burned arm he was allowed to go home. The two men were alone in the works at the time and were preparing for the arrival of the staff to begin the day's work. They were in the refrigerating room, where an ammonia cooling apparatus is installed. There was a flash and flames shot out. Harlock, who received the full force of the explosion, was badly injured and was dead when picked up by men working in neighbouring premises. MacGibbon was near his boiler and was burned by the flames which shot out. The fire brigade, who wore gas masks because of the presence of ammonia fumes, soon extinguished the fire.

THE SHIPMENTS OF CHINA CLAY for July were more satisfactory to the Cornish trade. Fortunately the home markets have been a great source to the producers of both china clay and china stone, and if all the uses to which these products are applied are developed as they should be, the industry can look forward to overtake the record created just before the war, when it reached its million tons level. The European situation is having considerable effect on the British china clay and china stone trade at the moment. The shipments made in July were as follows:—Fowey, 39,185 tons china clay; 3,442 tons china stone; 2,317 tons ball clay. Par, 12,402 tons china clay; 162 tons china stone. Charlestown, 3,933 tons of china clay; 1,072 tons of china stone. Padstow, 611 tons of china clay. Loos, 466 tons china clay. Plymouth, 165 tons of china clay. Newham, 149 tons of china clay. Rail to inland towns, 5,187 tons of china clay, making a total of 69,122 tons compared with 69,891 tons in July, 1935. The shipments included 62,129 tons of china clay, 4,676 tons china stone, and 2,317 tons of ball clay.

## Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Specifications Open to Public Inspection

- CHEMICAL REACTION PROCESS utilising coherer action.—H. Kikuchi. Feb. 9, 1935. 377/36.  
 VAT DYESTUFFS and intermediate products therefor.—Soc. of Chemical Industry in Basle. Feb. 4, 1935. 3356/36.  
 KETONES OF THE PYRENE SERIES.—Soc. of Chemical Industry in Basle. Feb. 4, 1935. 3358/36.  
 MANUFACTURE OF COLOURED MASSES.—Soc. of Chemical Industry in Basle. Feb. 6, 1935. 3652/36.  
 MANUFACTURE OF CLEAR SOAP with the employment of sulphite cellulose spent lye.—K. Braun and H. Plauson. Feb. 7, 1935. 3738/36.  
 COLOURING COMPOSITIONS.—British Celanese, Ltd. Feb. 9, 1935. 3741/36.  
 PURIFYING FEEDWATER FOR BOILERS.—I. G. Farbenindustrie. Feb. 7, 1935. 3793/36.  
 PACKAGES OF CHEMICALS.—I. G. Farbenindustrie. Feb. 8, 1935. 4012/36.  
 OXYGEN-CONTAINING COMPOUNDS OF CERIUM.—Soc. De Produits Chimiques des Terres Rares. Feb. 8, 1935. 4057/36.  
 HIGHER BOILING HYDROCARBONS FROM OLEFINES.—International Hydrogenation Patents Co., Ltd. Aug. 4, 1934. 21648/36.

### Specifications Accepted with Date of Application

- IRON EXCHANGE MATERIALS.—United Water Softeners, Ltd. April 13, 1934. 450,574.  
 TREATMENT OF WATER and aqueous solutions.—United Water Softeners, Ltd. April 13, 1934. 450,575.  
 RECOVERY OF PHENOLS from waste aqueous liquors.—Counts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). April 16, 1935. 450,716.  
 DEODORIZING COMPOSITIONS.—A. R. White. April 23, 1935. 450,717.  
 WETTING, EMULSIFYING, DISPERSING, AND CLEANSING AGENTS.—Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Reunis Etablissements Kuhlmann. May 2, 1934. 450,579.  
 CELLULOSE AND CELLULOSE DERIVATIVES.—Deutsche Bekleidungsindustrie Ges. June 1, 1934. 450,612.  
 PRODUCTION OF VALUABLE PRODUCTS, in particular paraffin wax from substances containing bitumen, such as coals, shales, and the like.—H. E. Potts (International Hydrogenation Patents Co., Ltd.). June 17, 1935. 450,721.  
 AZO DYESTUFFS.—Soc. of Chemical Industry in Basle. July 21, 1934. 450,618.  
 CYCLOHEXYLALYLHYDANTOINS.—Chemical Works, formerly Sandoz. Oct. 8, 1934. 450,737.  
 SUBSTITUTED AMINO-m-PHENANTHROINES.—J. Böeseken, and U. G. Bijlsma. Oct. 3, 1935. 450,624.  
 ACTIVATING TREATMENTS of bentonites and subbentonites for filtering and decolorizing purposes.—E. McKellar, and R. R. Cooper. Oct. 21, 1935. 450,738.  
 TREATING TITANIUM DIOXIDE.—American Zinc, Lead, and Smelting Co. Nov. 5, 1934. 450,797.  
 AZO DYESTUFFS CONTAINING CHROMIUM.—Soc. of Chemical Industry in Basle. Dec. 18, 1934. 450,638.  
 SURFACE TREATMENT OF MAGNESIUM and high percentage magnesium alloys for the purpose of increasing the resistance to corrosion thereof.—W. H. A. Thiemann (I. G. Farbenindustrie). March 4, 1936. 450,589.

- POLYMERIZATION PRODUCTS OF OLEFINES.—A. Carpmal (I. G. Farbenindustrie). Dec. 20, 1934. 450,668.  
 PRODUCTION OF ESTERS.—Celluloid Corporation. March 31, 1934. 450,891.  
 TREATING GLYCERIDE FATS AND OILS.—S. Musher. Feb. 10, 1934. 451,340.  
 PRODUCING OLEFINE GASES.—H. P. Stephenson, and R. G. Israel. Nov. 7, 1934. 451,575.  
 PROCESS OF WASHING OR CLEANSING TEXTILE MATERIALS and washing therefor.—W. W. Groves (I. G. Farbenindustrie). Nov. 26, 1934. 451,342.  
 AROMATIC NITROGEN COMPOUNDS.—W. W. Groves (I. G. Farbenindustrie). Dec. 28, 1934. 451,348.  
 CONDENSATION PRODUCTS.—W. J. Tennant (Henkel and Cie, Ges.). Dec. 29, 1934. 451,278.  
 AMINES OF THE ATIO-CHOLANE OR ATIO-ALLOCHOLANE SERIES.—A. G. Bloxam (Soc. of Chemical Industry in Basle). Jan. 2, 1935. 451,352.  
 QUATERNARY AMMONIUM COMPOUNDS OF IMIDAZOLES.—Soc. of Chemical Industry in Basle. Feb. 1, 1934. 451,500.  
 MANUFACTURE OF DEXTROSE.—International Patents Development Co. Feb. 2, 1934. 451,589.  
 WETTING AGENT FOR MERCERIZING LIQUORS.—I. G. Farbenindustrie. Feb. 3, 1934. 451,355.  
 AMINOPYRENE-SULPHONIC ACIDS.—I. G. Farbenindustrie. Feb. 3, 1934. 451,356.  
 MANUFACTURE OF VALUABLE PRODUCTS from boron fluoride and oxy-acids of phosphorus.—A. Carpmal (I. G. Farbenindustrie). Feb. 4, 1935. 451,359.  
 VAT COLOUR POWDERS.—E. I. due Pont de Nemours and Co. Feb. 5, 1934. 451,419.  
 PRODUCTION OF NITRILES.—W. W. Groves (I. G. Farbenindustrie). Feb. 5, 1935. 451,594.  
 AZO DYESTUFFS.—A. Carpmal (I. G. Farbenindustrie). Feb. 5, 1935. 451,420.  
 CRACKING HYDROCARBON OILS.—Counts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Feb. 6, 1935. 451,656.  
 MANUFACTURE OF CELLULOSE ESTERS.—Distillers Co., Ltd., H. A. Auden, and H. P. Staudinger. Feb. 7, 1935. 451,660.  
 IMPROVING CARBON BLACK.—Counts and Co., F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Feb. 8, 1935. 451,602.  
 AZO DYESTUFFS.—I. G. Farbenindustrie. Feb. 9, 1934. 451,665.  
 COATED FABRICS.—E. I. due Pont de Nemours and Co. March 9, 1934. 451,669.  
 AZO DYESTUFFS.—I. G. Farbenindustrie. Feb. 9, 1934. 451,673.  
 HIGHLY POLYMERIC ARTIFICIAL MATERIALS and mixed polymerisates.—W. W. Groves (Deutschen Celluloid-Fabrik). Feb. 11, 1935. 451,675.  
 PURIFYING PRODUCTS containing intermediary ferments of metabolism.—Schering-Kahlbaum, A.-G. Feb. 10, 1934. 451,429.  
 PRODUCTION OF HYDROGEN CYANIDE.—Counts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Feb. 28, 1935. 451,609.  
 PRODUCTION OF DISULPHIDES from 2-mercaptobenzthiazole and its homologues and substitution products.—Silesia Verein Chemischer Fabriken. Aug. 3, 1934. 451,437.  
 PRODUCTION OF NITRILES.—Counts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). March 1, 1935. 451,438.  
 PRODUCTION OF VINYL ACETYLENE.—Counts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). March 8, 1935. 451,442.

WATER-IN-SOLUBLE AZO DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie). March 15, 1935. 451,369.

N-VINYL COMPOUNDS.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). March 18, 1935. 451,444.

PREPARATION OF A PLASTIC COMPOUND.—W. H. Boorne. March 21, 1935. 451,523.

STABILISATION OF POLYMERISED OILS and acids and esters obtained therefrom, and lubricants containing such polymers.—Standard Oil Development Co. May 2, 1934. 451,372.

AQUEOUS DISPERSIONS OF ANHYDRIDES of fatty acids of high molecular weight.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Apr. 23, 1935. 451,300.

MANUFACTURE OF DERIVATIVES OF PYRAZINE-MONOCARBOXYLIC ACID.—K. Merck, W. Merck, L. Merck, and F. Merck (trading as E. Merck (firm of)). July 7, 1934. 451,304.

DIALKYLAMINOALCOHOLS.—Carbide and Carbon Chemicals Corporation. Aug. 25, 1934. 451,630.

MANUFACTURE OF AZO DYESTUFFS ON THE FIBRE.—Soc. of Chemical Industry in Basle. Oct. 13, 1934. 451,468.

AMINO-ONYPHTHALENE SULPHONIC ACIDS.—Soc. of Chemical Industry in Basle. Dec. 18, 1934. 451,478.

LUBRICANTS AND LUBRICATION.—C. Arnold (C. F. Prutton, and A. K. Smith). Dec. 29, 1934. 451,411-2.

### Applications for Patents

(August 6 to 12 inclusive.)

MANUFACTURE OF TITANIUM PIGMENTS.—R. W. Anderson, A. G. Oppgaard and British Titan Products Co., Ltd. 21,840.

CONDENSATION REACTIONS EMPLOYING ALKALI METALS, ETC.—A. Carpmael (I. G. Farbenindustrie). 21,722.

MANUFACTURE OF TITANIC ACID ESTERS.—A. Carpmael (I. G. Farbenindustrie). 21,842.

MANUFACTURE OF UNSATURATED ALIPHATIC CARBOXYLIC ACIDS.—W. W. Groves (I. G. Farbenindustrie). 22,107.

MANUFACTURE OF BENZENECARBOXYLIC ACID FLUORIDES CONTAINING TRIFLUOROMETHYL GROUPS.—W. W. Groves (I. G. Farbenindustrie). 22,209.

MANUFACTURE OF TRIFLUOROMETHYLPHENYLSULPHONES.—W. W. Groves (I. G. Farbenindustrie). 22,205.

MANUFACTURE OF ACYL PEROXIDES.—W. W. Groves (I. G. Farbenindustrie). 22,206.

MANUFACTURE OF RESINOUS CONDENSATION PRODUCTS.—W. W. Groves (I. G. Farbenindustrie). 22,207.

MANUFACTURE OF BENZOIC ACID CHLORIDES.—W. W. Groves (I. G. Farbenindustrie). 22,208.

MANUFACTURE OF COMPOUNDS OF PHENANTHRENE SERIES.—I. G. Farbenindustrie. (Germany, Aug. 10, 1935). 22,033.

NITROCELLULOSE COMPOSITIONS.—Imperial Chemical Industries, Ltd. 22,050.

NON-DETONATING BLASTING EXPLOSIVES.—Imperial Chemical Industries, Ltd. 22,051.

TREATMENT OF PAPER, ETC.—Imperial Chemical Industries, Ltd. 22,035.

PRODUCTION OF HIGHER BOILING HYDROCARBONS FROM OLFINES.—International Hydrogenation Patents Co., Ltd. (Aug. 1, 1935.) (United States, Aug. 4, 1934.) 21,648.

PRODUCTION OF PACKING MATERIALS.—G. W. Johnson (I. G. Farbenindustrie). 21,684.

SOFTENING AGENTS FOR POLYMERISED VINYL COMPOUNDS.—G. W. Johnson (I. G. Farbenindustrie). 21,973.

MEANS FOR WASHING OUT WEAK ACIDS FROM GASES.—G. W. Johnson (I. G. Farbenindustrie). 22,133.

PRODUCTION OF BLUE PIGMENTS.—Kali-Chemie. (Germany, Aug. 28, 1935.) 21,997.

PROCESS OF REFINING MINERAL OILS.—R. Meyer. (Germany, Aug. 12, 1935.) 22,199.

PRODUCTION OF SODIUM FLUORIDE SALTS, ETC.—W. Miersch. 22,197.

PRODUCTION OF HIGHER MOLECULAR ORGANIC COMPOUNDS.—Naamloose Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, Aug. 21, 1935.) 22,013.

PROCESS OF HALOGENATING UNSATURATED ORGANIC COMPOUNDS.—Naamloose Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Aug. 21, 1935.) 22,237.

PREPARATION OF MAGNESIUM.—National Processes, Ltd., S. Robson. 21,781.

RECOVERY OF SULPHUR FROM SULPHUROUS GASES.—M. W. Travers (National Smelting Co., Ltd.) 21,836.

PRODUCTION OF NITRATES OF PHENOLS, ETC.—J. Schindelmeiser. 22,000.

MANUFACTURE OF AZO DYESTUFFS.—F. Zwilmeyer. 22,052.

## Chemical and Allied Stocks and Shares

ALTHOUGH reduction in the volume of business has been reported in most sections of the Stock Exchange this week, share values have been well maintained. Shares of chemical and associated companies were very steady. Imperial Chemical ordinary and deferred shares held last week's rise to 40s. and 9s. 9d. respectively, and B. Laporte changed hands at over 130s. Boots Pure Drug 5s. shares were active and have moved up to 58s. 3d. at the time of writing. On the basis of the total distribution of 29 per cent. (5 per cent. of which is described as a bonus and is paid tax free) the yield on the shares of the latter company is less than 3 per cent. gross. This has to be read in relation to the company's particularly strong balance sheet position and substantial reserves which are considered in the market to suggest the possibility of a share bonus in the future. Triplex Safety Glass were a prominent feature with another large rise to 116s. 6d. on the doubling of the distribution on these 10s. shares to 60 per cent. and on the possibility that the annual meeting, expected to be held in the early part of next month, may provide news as to a share bonus.

There was again a very steady tendency in the 5s. ordinary and 10s. preference shares of Greif-Chemicals Holdings which are virtually unchanged at 9s. and 11s. 9d. respectively. Turner and Newall continued to show active business, the indications of increasing uses for asbestos having tended to increase market anticipations that a favourable rise in dividend is in prospect. British Oxygen were rather less prominent, but the belief that the directors intend to erect a large carbide factory either in Scotland or Wales was a factor which attached a good deal of interest to the ordinary stock units. Metal Industries "B" ordinary shares, in which dealings started recently, were in request around 42s. 3d., largely because they afford an indirect means of acquiring an interest in British Oxygen as Metal Industries is a large shareholder in this company. Erimoid remained at 8s. 9d. on continued hopes that the dividend will be maintained at 10 per cent.

Lawes' Chemical were virtually unchanged at 8s. 1½d. awaiting the results, and Cooper, McDougall and Robertson were lower at 37s. 6d., against 38s. 9d., although it is expected in the market that the interim dividend of the latter company will be at least maintained and that there are possibilities of a larger total dividend. Fison, Packard and Prentice were rather higher at around 44s. 6d., aided by market hopes of a moderate increase in dividend. United Premier Oil and Cake moved up 4½d. to 12s. 6d. and British Oil and Cake Mills preferred shares were 3d.

up at 49s. 7½d. It continues to be assumed in the market that the upward tendency in prices of the products of the two latter companies is likely to be continued and that their profits may benefit accordingly. Unilever have reacted 7½d. to 35s. 1½d., but there has been a good deal of profit-taking in International Nickel following their recent rise, although the further increase in earnings shown by the quarterly figures created an excellent impression. International Nickel shares invariably tend to move closely with New York market conditions. British Industrial Plastics 2s. shares were again at 4s. Imperial Smelting have lost 6d. to 16s. 6d. at the time of writing, largely owing to uncertainty as to the outlook for zinc prices.

The 3s. shares of William Blythe changed hands at 7s. at one time but a buyer might have to give more than this; the shares appear to continue to be held very firmly. British Drug Houses transferred down to 18s. 9d., but continue to be quoted at 20s. middle. This is another share which is held firmly, the yield offered being regarded as attractive in view of the company's satisfactory dividend record. Timothy Whites and Taylors 5s. shares were maintained around 30s. and appeared to be attracting increasing attention owing to market hopes of a larger dividend. At the last annual meeting the chairman indicated that it would probably be some time before full benefits accrued from the amalgamation represented by the company—but it is assumed that profits are reflecting the increased spending power of the public. Sangers were moderately higher at 28s. 6d. Ever since the company's formation these 5s. shares have received good dividends and earnings on them have benefited in recent years from the large expansion in the company's activities which has resulted from the various businesses acquired. An increase in the authorised capital was sanctioned at the last meeting and it is hoped in the market that if further capital is required, shareholders may perhaps later on have the offer of additional shares on favourable terms.

Paint shares were more active: Pinchin Johnson on prospects of a bonus sooner or later and International Paint on hopes of an increase in the forthcoming interim dividend. Conssett Iron and Staveley Coal & Iron were again active, the last-named having continued to benefit from the favourable dividend estimates current in the market. Elsewhere, Calico Printers issues were reactionary on the disappointing results and the omission of the preference dividend. Leading oil shares were less active, with the exception of "Shell" which have made a higher price.

## Weekly Prices of British Chemical Products

PRICES of chemical products have remained unchanged in the London market this week. Unless otherwise stated the prices quoted below cover fair quantities net and naked at sellers' works.

MANCHESTER.—Although still very much under the influence of the holidays, business in chemicals on the Manchester market during the past week has not been quite so dull as it has been of late. Business, however, is still on a relatively small scale in the aggregate and no marked improvement is anticipated until this month is out. Deliveries of chemicals in a number of directions locally continue to be affected by holiday stoppages at consuming works, although in this respect the position is not so bad as it was during the previous fortnight. Apart from this restrictive factor, conditions generally at the consuming end of the trade are satisfactory and the movement of many descriptions of products for textile dyeing and printing shows a slight but

welcome improvement. The chemical market as a whole maintains a steady front.

GLASGOW.—There has been a limited demand for chemicals during the week, but values continue steady at former rates. With holiday influences out of the way manufacturers and merchants alike look forward to a stronger support for coal tar products, particularly the cruder fractions pitch and creosote oil. There is evidence of pitch being offered at a lower rate for bulk f.o.b. Glasgow, although the quantities moving at present are not large, and the price is more or less nominal about 30s. to 35s. in bulk at works. Prices of cresylic acid remain steady as last quoted. There has been some movement in high boiling tar acids and, with other fractions now definitely scarce, further booking is anticipated. Naphthas and pyridines maintain their present values, with the demand about equalling the supply.

### General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £64 to £65 ex wharf, according to quantity.

ACID, ACETIC.—40% technical, £16 12s. 6d. per ton. LONDON: Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, in 1 cwt. bags, £28; powdered, in 1 cwt. bags, £29.

ACID, CHROMIC.—Flaked, 10d. per lb., less 2½%; ground, 10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 11½d. to 1s. SCOTLAND: B.P. crystals, 1s. per lb., less 5%.

ACID, CRESYLIC.—97/99%, 2s. 11d. to 3s. per gal.; pale, 98%, 3s. 1d. to 3s. 2d.; dark, 2s. 6d. to 2s. 7d.; 99/100%, refined, 3s. 4d. to 3s. 6d. per gal.

ACID, FORMIC.—LONDON: £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: £2 10s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11½d., less 5%. SCOTLAND: 11½d. less 5%. MANCHESTER: 11½d. to 1s. per lb.

ALUM.—SCOTLAND: Ground, £10 2s. 6d. per ton; lump, £9 12s. 6d. ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHRIMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammioniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammioniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 per ton.

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £17 10s. ex store. MANCHESTER: White powdered Cornish £19 ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £11.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton in casks. special terms for contracts. SCOTLAND: £9.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal,

£15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots. SCOTLAND: Granulated, £14 10s. per ton in 1 cwt. bags, carriage paid.

CADMIUM SULPHIDE.—3s. 9d. to 4s. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. SCOTLAND: £5 10s. per ton net ex store.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3½d. to 4½d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 18s. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£25 to £27 per ton.

LEAD ACETATE.—LONDON: White, £33 15s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £34, brown £33.

LEAD NITRATE.—£32 10s. to £34 10s. per ton

LEAD, RED.—SCOTLAND: £31 per ton less 2½%, carriage paid,

LEAD, WHITE.—SCOTLAND: £33 per ton, carriage paid. LONDON: £41.

LITHOPONE.—30%, £16 to £16 5s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store

MAGNESIUM CHLORIDE.—SCOTLAND: £6 17s. 6d. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PARAFFIN WAX.—SCOTLAND: 3½d. per lb.

PHENOL.—6½d. to 7½d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39.

POTASSIUM BICHRIMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. per lb. less 5% carriage paid. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 4½d. per lb. MANCHESTER: £38 10s. per ton.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8½d. per lb. SCOTLAND: B.P. Crystals, 8½d. MANCHESTER: B.P. 11d.

POTASSIUM PRUSSIAN.—LONDON: Yellow, 7½d. to 8d. per lb. SCOTLAND: 7½d. net, ex store. MANCHESTER: Yellow, 8½d. to 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £17 15s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: £12 10s. per ton in 1 cwt. kegs, £10 15s. per ton in 2 cwt. bags. MANCHESTER: £10 10s.

**SODIUM BICHROMATE.**—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. SCOTLAND: 4d., less 5% carriage paid.

**SODIUM BISULPHITE POWDER.**—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

**SODIUM CARBONATE, MONOHYDRATE.**—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

**SODIUM CHLORATE.**—£29 per ton. SCOTLAND: £1 10s. per cwt.

**SODIUM CHROMATE.**—4d. per lb. d/d U.K.

**SODIUM HYPOSULPHITE.**—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

**SODIUM IODIDE.**—B.P., 6s. per lb.

**SODIUM METASILICATE.**—£14 per ton, d/d U.K. in cwt. bags.

**SODIUM NITRITE.**—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

**SODIUM PERBORATE.**—10%, 9½d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

**SODIUM PHOSPHATE.**—£13 per ton.

**SODIUM PRUSSIAN.**—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5½d. ex store. MANCHESTER: 5d. to 5½d.

**SODIUM SILICATE.**—140° Tw. Spot, £8 per ton, SCOTLAND: £8 10s.

**SODIUM SULPHATE (GLAUBER SALTS).**—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

**SODIUM SULPHATE (SALT CAKE).**—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d. to £3 5s.

**SODIUM SULPHIDE.**—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

**SODIUM SULPHITE.**—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

**SULPHATE OF COPPER.**—MANCHESTER: £15 per ton f.o.b. SCOTLAND: £16 10s. per ton less 5%.

**SULPHUR.**—£9 to £9 5s. per ton. SCOTLAND: £8 to £9.

**SULPHUR CHLORIDE.**—5d. to 7d. per lb., according to quality.

**SULPHUR PRECIP.**—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

**VERMILION.**—Pale or deep, 4s. 6d. per lb. in 1-cwt. lots.

**ZINC CHLORIDE.**—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

**ZINC SULPHATE.**—LONDON: £12 per ton. SCOTLAND: £10 10s.

**ZINC SULPHIDE.**—10d. to 11d. per lb.

### Nitrogen Fertilisers

**SULPHATE OF AMMONIA.**—August, £6 14s. 6d. per ton; September, £6 16s.; October, £6 17s. 6d.; November, £6 19s.; December, £7 0s. 6d. for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station. MANCHESTER: Brown, £9; grey, £10 10s.

**CALCIUM CYANAMIDE.**—August, £6 15s. per ton; September, £6 16s. 3d.; October, £6 17s. 6d.; November, £6 18s. 9d.; December, £7; carriage paid to any railway station in Great Britain in lots of 4 tons and over.

**NITRO-CHALK.**—£7 5s. per ton to end of September.

**NITRATE OF SODA.**—£7 12s. 6d. per ton to end of September.

**CONCENTRATED COMPLETE AND AMMONIUM PHOSPHATE FERTILISERS.**—Prices have not yet been fixed and at present it is impossible to give any indication as to the date of any announcement or of the trend of prices.

### Coal Tar Products

**ACID, CRESYLIC.**—97/99%, 2s. 10d. to 2s. 11d. per gal.; 99/100%, 3s. 3d. to 3s. 9d. per gal., according to specification; pale 98%, 3s. to 3s. 1d.; dark, 2s. 4d. to 2s. 5d. GLASGOW: Pale, 99/100%, 2s. 9d. to 3s. 3d. per gal.; pale, 97/99%, 2s. 6d. to 2s. 9d.; dark, 97/99%, 2s. 3d. to 2s. 4d.; high boiling acids, 1s. 8d. to 2s.; American specification, 2s. 9d. to 3s.

**ACID, CARBOLIC.**—Crystals, 6½d. to 7½d. per lb.; crude, 60's, 2s. 3d. to 2s. 6d. per gal. MANCHESTER: Crystals, 6½d. per lb.; crude, 2s. 7d. per gal. GLASGOW: Crude, 60's, 2s. 4d. to 2s. 6d. per gal.; distilled, 60's, 2s. 8d. to 3s.

**BENZOL.**—At works, crude, 8½d. to 9d. per gal.; standard motor 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 7d. to 1s. 7½d. LONDON: Motor, 1s. 3½d. GLASGOW: Crude, 8½d. to 9d. per gal.; motor, 1s. 3d. to 1s. 4d.

**CREOSOTE.**—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 4½d. f.o.r. North; 5d. LONDON. MANCHESTER: 4½d. to 5½d. GLASGOW: B.S.I. Specification, 5½d. to 5½d. per gal.; washed oil, 4½d. to 4½d.; lower sp. gr. oils, 4½d. to 5d.

**NAPHTHA.**—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/100%, 1s. 7d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW: Crude, 5½d. to 6d. per gal.; 90%, 160, 1s. 4d. to 1s. 5d.; 90% 190, 1s. to 1s. 1d.

**NAPHTHALENE.**—Crude, whizzed or hot pressed, £16 10s. per ton; purified crystals, £25 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £7 to £8 per ton (bags free).

**PYRIDINE.**—90/140%, 5s. to 7s. per gal.; 90/180, 2s. 3d. GLASGOW: 90% 140, 6s. to 6s. 6d. per gal.; 90% 160, 5s. to 5s. 6d.; 90% 180, 2s. 6d.

**TOLUOL.**—90%, 1s. 11d. per gal.; pure, 2s. 3d. GLASGOW: 90% 120, 1s. 11d. to 2s. per gal.

**XYLOL.**—Commercial, 2s. per gal.; pure, 2s. 2d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

**PITCH.**—Medium, soft, 35s. to 36s. per ton, in bulk at makers works. MANCHESTER: 32s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 30s. to 35s. per ton; in bulk for home trade, 32s. 6d.

### Wood Distillation Products

**ACETATE OF LIME.**—Brown, £8 to £8 10s. per ton; grey, £10 5s. to £10 15s. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9; grey, £10.

**CHARCOAL.**—£5 to £10 per ton, according to grade and locality.

**METHYL ACETONE.**—40-50%, £45 to £48 per ton.

**WOOD CREOSOTE.**—Unrefined 6d. to 1s. 6d. per gal., according to boiling range.

**WOOD, NAPHTHA, MISCIBLE.**—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 9d. per gal.

**WOOD TAR.**—£2 to £2 10s. per ton.

### Intermediates and Dyes

**ACID, BENZOIC, 1914 B.P. (ex Toluol).**—1s. 9½d. per lb.

**ACID, GAMMA.**—Spot, 4s. per lb. 100% d/d buyer's works.

**ACID, H.**—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

**ACID NAPHTHIONIC.**—1s. 8d. per lb.

**ACID, NEVILLE AND WINTHER.**—Spot, 3s. per lb. 100%.

**ACID, SULPHANILIC.**—Spot, 8d. per lb. 100%, d/d buyer's works.

**ANILINE OIL.**—Spot, 8d. per lb., drums extra, d/d buyer's works.

**ANILINE SALTS.**—Spot, 8d. per lb. d/d buyer's works, casks free.

**o-CRESOL 30/31° C.**—6d. per lb. in 1-ton lots.

**p-CRESOL 34-5° C.**—1s. 6d. per lb. in ton lots.

**m-CRESOL 98/100%.**—1s. 7d. per lb. in ton lots.

**DICHLORANILINE.**—1s. 11½d. to 2s. 3d. per lb.

**DIMETHYLANILINE.**—Spot, 1s. 6d. per lb., package extra.

**DINITROBENZENE.**—8d. per lb.

**DINITROTOLUENE.**—48/50° C., 9d. per lb.; 66/68° C., 10½d.

**DINITROCHLOROBENZENE, SOLID.**—£72 per ton.

**DIPHENYLAMINE.**—Spot, 2s. per lb., d/d buyer's works.

**α-NAPHTHOL.**—Spot, 2s. 4d. per lb., d/d buyer's works.

**β-NAPHTHOL.**—In bags, £88 15s. per ton; in casks, £89 15s.

**α-NAPHTHYLAMINE.**—Lumps, 1s. per lb.; ground, 1s. 0½d.

**β-NAPHTHYLAMINE.**—Spot, 2s. 9d. per lb., d/d buyer's works.

**o-NITRANILINE.**—3s. 11d. per lb.

**m-NITRANILINE.**—Spot, 2s. 7d. per lb., d/d buyer's works.

**p-NITRANILINE.**—Spot, 1s. 8d. per lb., d/d buyer's works.

**NITROBENZENE.**—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

**NITRONAPHTHALENE.**—9d. per lb.; P.G., 1s. 0½d. per lb.

**SODIUM NAPHTHIONATE.**—Spot, 1s. 9d. per lb.

**o-TOLUIDINE.**—9½d. to 11d. per lb.

**p-TOLUIDINE.**—1s. 11d. per lb.

### Latest Oil Prices

LONDON (Baltic Exchange), Aug. 19.—LINSEED OIL was quiet. Spot, £28 10s. per ton (small quantities); Sept.-Dec., £26 5s.; Jan.-April, £26 5s., naked. SOYA BEAN OIL was steady. Oriental (bulk), spot, Rotterdam, £24 10s. per ton. RAPE OIL was firm. Crude, extracted, £34 10s. per ton; technical, refined, £35 10s., naked, ex wharf. COTTON OIL was easy. Egyptian, crude, £29 5s. per ton; refined common edible, £32 15s.; deodorised, £34 15s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was lower. American, spot, 40s. per cwt.

LULL, Aug. 19.—LINSEED OIL, spot, quoted £27 5s. per ton; Aug. and Sept.-Dec., £26 15s.; Jan.-April, £26 10s. COTTON OIL, Egyptian, crude, spot, £30; edible refined, spot, £32 10s.; technical, spot, £32 10s.; deodorised, £34 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £23, naked. GROUNDNUT OIL, extracted, spot, £34; deodorised, £37. RAPE OIL, extracted, spot, £33 10s.; refined, £34 10s. SOYA OIL, extracted, spot, £29 10s.; deodorised, £32 10s. per ton. COD OIL, f.o.r. or f.a.s., 25s. per cwt., in barrels. CASTOR OIL, pharmaceutical 43s. per cwt.; firsts, 38s.; seconds, 36s. TURPENTINE, American, spot, 42s. 9d. per cwt.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

### Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

**MIDLAND TAR DISTILLERS LTD.**, Birmingham, (M., 22/8/36.) August 6. £100,000 debenture stock and premium of 1 per cent. secured by trust deed dated July 24, 1936; charged on lands at Oldbury, etc., also general charge. \*£150,000, November 7, 1935.

### County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

**WOODS, R. E. & CO.** (firm), 15 Little Camden Street, Camden Town, manufacturing chemists. (C.C., 22/8/36.) £17 5s. 0d. July 10.

## Company News

**The United Indigo and Chemical Co.**—A dividend of  $6\frac{1}{2}$  per cent., less tax, is announced on the ordinary shares for the year ended June 30 last, together with an excess payment of  $1\frac{1}{2}$  per cent. on the preference shares, payable September 9. This dividend shows an advance of  $1\frac{1}{2}$  per cent. on the previous year's distribution of 5 per cent.

**Yorkshire Dyeing and Proofing.**—The net profit for the year ended June 30 last amounts to £24,857, compared with £20,809 last year. To this is added £3,364 brought in, making £30,221. To reserve £7,500, the same as last year; to dividend of 8 per cent., less tax ( $7\frac{1}{2}$  per cent.), £15,200, leaving £7,521 forward.

## New Companies Registered

**British Carbonic Co., Ltd.**—Registered July 29. Nominal capital, £3,000. To carry on the business of manufacturers of and dealers in carbonic acid in liquid or solid form, ice manufacturers and merchants, manufacturers of and dealers in refrigerators, etc. A subscriber: Andrew F. A. Powles, Amberley House, Norfolk Street, Strand, W.C.2.

**W. A. C. Mountain, Ltd.**—Registered August 17. Nominal capital, £6,000. To acquire the business of soap, starch and chemical manufacturers heretofore carried on by Walter A. C. Mountain and Hilda D. Mountain at Bredbury, near Stockport. Directors: Walter A. C. Mountain "Ashlawn," Stockport Road, Bredbury, near Stockport; Miss Hilda D. Mountain.

## Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

**British West Indies.**—A firm of commission and general merchants established at Bridgetown, Barbados, wish to obtain the representation, on a purchasing basis, of United Kingdom producers of cotton seed oil and soya bean oil. (Ref. No. 149.)

**Peru.**—A firm of importers and distributors in Lima with wide distribution throughout Peru desire to secure the representation of United Kingdom manufacturers of drugs and pharmaceuticals. A partner is at present in London. (Ref. No. 164.)

## New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

**Beckolin.** 561,267. All goods included in Class I. Beck, Koller and Co. (England), Ltd., 479 Edge Lane, Liverpool. July 2, 1935.

**Rhodanize.** 561,208. Salts of precious metals for use in manufactures; and electrolytes containing rhodium for use in electroplating. Baker Platinum, Ltd., 52 High Holborn, London, W.C.1. June 29, 1935.

**Bedinite.** 560,487. China clay. English Clays Lovering Pochin and Co., Ltd., 14 High Cross Street, St. Austell, Cornwall. May 27, 1935.

**Kalampron.** 562,080. Colours included in Class 1. Society of Chemical Industry in Basle, 141-227 Klybeckstrasse, Basle, Switzerland. August 8, 1935. Address for service in the United Kingdom is c/o Abel and Imray, 30 Southampton Buildings, London, W.C.2.

**Selloid.** 561,079. Dispersing agents, being chemical substances for use in the precipitation of colouring matters in the manufacture of pigments. The Geigy Colour Co., Ltd., National Buildings, Parsonage, Manchester, 3. June 25, 1935.

**Kalampron.** 562,081. Colours included in Class 4. Society of Chemical Industry in Basle, 141-227 Klybeckstrasse, Basle, Switzerland. August 8, 1935. Address for service in the United Kingdom is c/o Abel and Imray, 30 Southampton Buildings, London, W.C.2.

## Books Received

**Differential Equations in Applied Chemistry.** By Frank L. Hitchcock and Clark S. Robinson. Second edition. New York: John Wiley. London: Chapman and Hall, Ltd. Pp. 120. 7s. 6d.

**A Textbook of Elementary Quantitative Analysis.** By Carl J. Engelder. Second edition. New York: John Wiley. London: Chapman and Hall, Ltd. Pp. 270. 13s. 6d.

**Semi-Micro Qualitative Analysis.** By Carl J. Engelder, Tobias H. Dunkelberger and William J. Schiller. New York: John Wiley. London: Chapman and Hall, Ltd. Pp. 265. 13s. 6d.

**Economic and Commercial Conditions in Roumania, March, 1936.** Report by Alexander Adams. London: H.M. Stationery Office. Pp. 62. 1s. 3d.

### Official Publications

**The Analysis of Commercial Lubricating Oils by Physical Methods.** Lubrication Research Technical Paper No. 1. Department of Scientific and Industrial Research. Pp. 54. H.M. Stationery Office, 1s.

## International Association for Testing Materials

### Second International Congress

AT its first Congress, held in Zurich in September, 1931, the International Association of Testing Materials accepted an invitation from the Committee representing British members to hold the next Congress in Great Britain, and recently the Permanent International Committee approved the suggestion submitted by the British Committee that the Congress should be held in London from April 19-24, 1937.

The object of the Congresses held by the International Association for Testing Materials is to obtain international co-operation in the study of materials and their testing, and to provide facilities for the exchange of views, experience and knowledge with regard to all matters connected with this subject. The London Congress should be of considerable scientific and industrial importance, particularly in view of the length of time which has elapsed since the study and testing of materials were last reviewed on an international basis.

Sir William Bragg, president of the Royal Society and director of the Royal Institution of Great Britain, has consented to be president of the London Congress.

Participation of the Congress will be open to all interested in the study of materials and their testing on payment of the membership fee. All requests for further information and inquiries should be addressed to the honorary secretary of the Congress, Mr. K. Headlam-Morley, at the offices of the British Committee, International Association for Testing Materials, 28 Victoria Street, London, S.W.1.

